NASA SP-7011 (70)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NASA SP-7011 (70)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Scientific and Technical Information System during November, 1969.

Scientific and Technical Information Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. DECEMBER 1969

NOTICE OF ERRATA

NASA SP-7011 (68), dated October 1969, that covered the items announced in *STAR* issues 17 and 18 and *IAA* issues 17 and 18 had the following omissions: personal authors, corporate sources and subject index terms from *STAR* 17. These missing items index points will be picked up and included in the 1969 annual index of *Aerospace Medicine and Biology*.

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INTRODUCTION

Aerospace Medicine and Biology is a continuing bibliography which, by means of periodic supplements, serves as a current abstracting and announcement medium for references on this subject. The publication is compiled through the cooperative efforts of the American Institute of Aeronautics and Astronautics (AIAA) and NASA Scientific and Technical Information Facility. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals, and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, NASA SP-7011, which was published in July, 1964. Supplements are identified by the same number followed by two additional digits in parentheses.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry consists of a standard citation accompanied by its abstract in the following order:

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b. AIAA entries identified by their *IAA* accession numbers (A69-10000 series).

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Technical Information Service
American Institute of Aeronautics and Astronautics, Inc.
750 Third Avenue, New York, N. Y. 10017

For further details please consult the *Introductions* to *STAR* and *IAA*, respectively.

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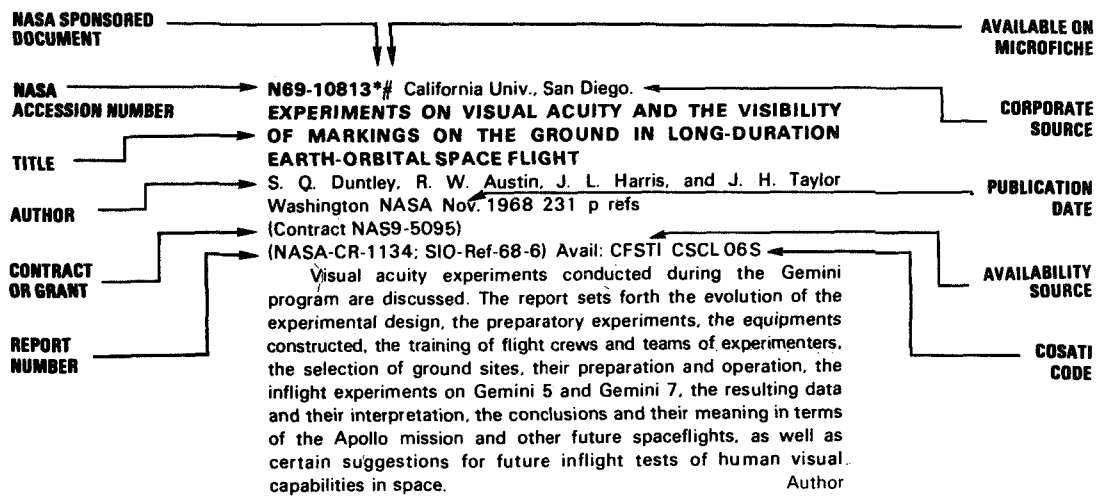

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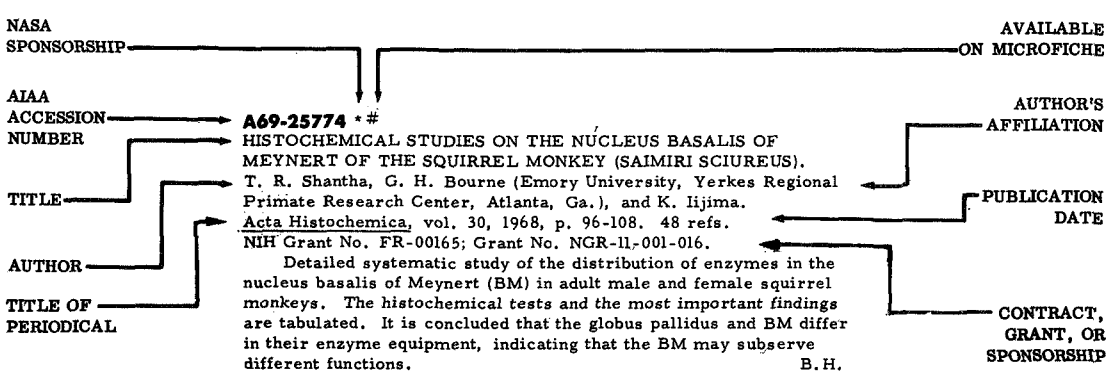

AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography DECEMBER 1969

STAR ENTRIES

N69-36025 Missouri Univ., Columbia.
AN X-RAY STUDY OF INTERPARTICLE INTERACTIONS
Ted Ray Taylor (Ph.D. Thesis) 1968 94 p
Avail: Univ. Microfilms: HC $4.80/Microfilm $3.00 Order No. 69-3416

Small angle X-ray scattering data from concentrated suspensions of southern bean mosiac virus and Na-montmorillonite clay were analyzed to calculate their pair correlation functions and pair potentials. The virus is composed of nearly uniform spherical particles, and the clay particles are platelets with a diameter much larger than their thickness. The pair correlation function and potential energy of southern bean mosiac virus were computed for concentrations of 20, 10 and 5 gm of virus per 100 ml of suspension. The pair correlation functions indicated relatively weak interparticle forces. The pair potential was found to be repulsive for all concentrations. One-dimensional pair potentials were calculated for six samples of Na-montmorillonite clay suspensions containing 10% clay by weight and various sodium metaphosphate concentrations. Potentials were also calculated for a set of five samples with varying clay and sodium metaphosphate concentrations. The pair potentials showed that the addition of sodium metaphosphate to 0.005 N had very little effect on the potential between pairs of platelets. Variation of the form of the potential with metaphosphate concentration suggests that there may be forces other than repulsive double layer and attractive Van der Waals forces acting between pairs of platelets. Dissert. Abstr.

N69-36066# Joint Publications Research Service, Washington, D.C.
SOVIET CYBERNETICS
11 Jul. 1969 68 p refs Transl. into ENGLISH from Probl. Kibernetiki (Moscow), no. 20, 1968 p 131–143, 217–223, 241–255, 257–276
Avail: CFSTI

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1. BEHAVIOR OF A GROUP OF AUTOMATA IN THE PROBLEM OF POWER REGULATION V. L. Stefanyuk p 1–15 refs (See N69-36067 21-07)
2. ALGEBRAIC OPERATIONS ON SYSTEMS OF OBJECTS A. M. Slinko p 16–23 (See N69-36068 21-19)
3. AUTOMATION MODEL OF THE HEART A. T. Kolotov p 24–42 refs (See N69-36069 21-04)
4. ON MODELING THE EVOLUTIONARY PROCESS CONSIDERING SELECTION T. I. Budgekova et al p 43–49 ref (See N69-36070 21-04)
5. CONCERNING MODELS OF THE COMPETITION OF SPECIES T. I. Bulgakova p 50–58 refs (See N69-36071 21-04)
6. CONCERNING THE STABILITY OF THE SIMPLEST MODEL OF BIOGEOCENOSIS T. I. Bulgakova p 59–65 ref (See N69-36072 21-04)

N69-36069# Joint Publications Research Service, Washington, D.C.
AUTOMATON MODEL OF THE HEART
A. T. Kolotov *In its* Soviet Cybernetics 11 Jul. 1969 p 24–42 refs (See N69-36066 21-04)
Avail: CFSTI

A discrete net of automata is described which may also serve as a model of the heart that incorporates a number of clinically observed properties of this organ. Particular attention is given to processes involving the onset and cessation of palpitation. In many respects, a comparison of this model with actuality can be carried further than in the case of a continuous model. A.C.R.

N69-36070# Joint Publications Research Service, Washington, D.C.
ON MODELING THE EVOLUTIONARY PROCESS CONSIDERING SELECTION
T. I. Budgekova et al *In its* Soviet Cybernetics 11 Jul. 1969 p 43–49 ref (See N69-36066 21-04)
Avail: CFSTI

A theory identifying the initial states of model populations, a treatment considered particularly favorable for studies of the evolutionary process, is analyzed for the condition when selection is introduced into the model. This condition leads to the occurrence of considerable drift in the population genotypes, and the basic mass evolves in a direction dictated by selection. Due to purely statistical circumstances, however, small groups of individuals split from the population; these are comparatively homogeneous in genotype and isolated in the sense of the possibility of having descendants. As such, they represent dead ends of evolution, or at best they evolve much more slowly. The basic mass of the population is therefore strongly mixed in genotype under the influence of selection, while relic forms exist which are distinct from the mass in genotype, few in number, and much less mixed. One problem involved clarifying whether or not the analogous phenomenon is observed in a comparatively rapidly evolving natural population, a factor which must be considered in constructing a mathematical theory of evolution. A.C.R.

N69-36071# Joint Publications Research Service, Washington, D.C.
CONCERNING MODELS OF THE COMPETITION OF SPECIES

T. I. Bulgakova *In its* Soviet Cybernetics 11 Jul. 1969 p 50–58 refs (See N69-36066 21-04)
Avail: CFSTI

Several theories regarding competition of biological species for food are briefly summarized and a model of competition proposed by A. A. Lyapunov is considered. This model consists of two species, y_1 and y_2, competing for food. The amount of food or the number of a third species, i.e., the victim, is x. In the absence of consumers, the amount of food is found to increase exponentially according to a set system of equations. The coordinates of the stationary point are calculated, as well as the necessary and sufficient conditions for the existence of a stable stationary point. From this, it is determined that the existence of intraspecies competition is a necessary condition for the system's stability. Attempts were also made to study the effect of hunting on a system with competing species. Finally, a model of competition for a particular case is considered, and formulas are derived for conditions under which a system with two species can exist for an infinitely long period of time. A.C.R.

N69-36072# Joint Publications Research Service, Washington, D.C.
CONCERNING THE STABILITY OF THE SIMPLEST MODEL OF BIOGEOCENOSIS
T. I. Bulgakova *In its* Soviet Cybernetics 11 Jul. 1969 p 59–65 ref (See N69-36066 21-04)
Avail: CFSTI

Models of trophic bonds in biogeocenosis are constructed in an investigation of stationary point stability for the simplest model. The general system to be modeled is described as one which includes populations of living organisms located in the same territory with different types of food at the disposal of each species. Each food consists of a number of components, and the composition is constant. An expression can therefore be formulated for the amount of food, and the dynamics of the number of species can be described by a system of differential equations. The simplest model is one in which one species is fed by one type of food with a single-substance component; this is analyzed to obtain the stationary point stability. A.C.R.

N69-36091# Joint Publications Research Service, Washington, D.C.
SELECTIONS FROM THE SOVIET JOURNAL SCIENCE AND RELIGION
24 Jul. 1969 15 p Transl. into ENGLISH from Nauka i Religiya (Moscow), no. 5, 1969 p 22–30
(JPRS-48484) Avail: CFSTI

CONTENTS:

1. LONG RANGE SCIENTIFIC PREDICTIONS ANALYZED V. I. Siforov p 1–6 (See N69-36092 21-04)
2. SIMULATION OF PSYCHOLOGICAL FUNCTIONS STUDIED A. Dobrovich p 7–14 (See N69-36093 21-04)

N69-36092# Joint Publications Research Service, Washington, D.C.
LONG RANGE SCIENTIFIC PREDICTIONS ANALYZED
V. I. Siforov *In its* Selections from the Soviet J. Sci. and Religion 24 Jul. 1969 p 1–6 (See N69-36091 20-04)
Avail: CFSTI

A discussion and an analysis of long range scientific predictions, especially in computer science, are offered. Does one need concern himself with long range forecasting, is it possible to foresee the distant future, what path leads to this, and what will be the social consequences of exceptionally rapid development of science and engineering, are some of the topics considered for discussion. J.M.C.

N69-36093# Joint Publications Research Service, Washington, D.C.
SIMULATION OF PSYCHOLOGICAL FUNCTIONS STUDIED
A. Dobrovich *In its* Selections from the Soviet J. Sci. and Religion 24 Jul. 1969 p 7–14 (See N69-36091 20-04)
Avail: CFSTI

A computerized simulation of psychological functions is offered as a means for man to become more familiar with himself. A comparison of the automatic machine with the human brain showed the computer as a never tiring, nonconfused, or distracted entity. Descriptive names are given to gifted and defective computers. J.M.C.

N69-36117# Haskins Labs., Inc., New York.
SPEECH RESEARCH Progress Report, 1 Oct.–31 Dec. 1968
Franklin S. Cooper Jun. 1968 152 p refs
(Contract N00014-67-A-0129)
(AD-676520; SR-12) Avail: CFSTI CSCL 17/2

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1. ON THE MOTOR CONTROL OF COARTICULATION IN CVC MONOSYLLABLES J. L. De Clerk (ECOM) and P. F. MacNeilage p 9–78 refs (See N69-36118 21-04)
2. STUDY OF NON-SPEECH VOLUNTARY PALATE MOVEMENTS BY SCALING AND ELECTROMYOGRAPHIC TECHNIQUES R. L. Shelton, K. S. Harris, G. N. Sholes, and P. M. Dooley p 79–101 refs (See N69-36119 21-04)
3. EXPERIMENTAL METHODS FOR SPEECH SYNTHESIS BY RULE I. G. Mattingly p 103–115 refs (See N69-36120 21-04)
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5. RULES FOR WORD STRESS ANALYSIS FOR CONVERSION OF PRINT TO SYNTHETIC SPEECH J. H. Gaitenby p 131–141 refs (See N69-36122 21-04)
6. DISCRIMINATION OF THREE-FORMANT NASAL-VOWEL SYLLABLES, PART 3 E. Garcia p 143–153 refs (See N69-36123 21-04)

N69-36118# Haskins Labs., Inc., New York.
ON THE MOTOR CONTROL OF COARTICULATION IN CVC MONOSYLLABLES
Peter F. MacNeilage and Joseph L. DeClerk (ECOM) *In its* Speech Res. Jun. 1968 p 9–78 refs Presented at the Conf. on Speech Commun. and Process., Cambridge, Mass., 6–8 Nov. 1967 (See N69-36117 21-04)
Avail: CFSTI

This study was an attempt to account for the motor control of speech production by a model in which discrete phoneme commands are modified according to phonological context by 3-motor system mechanisms. The model was evaluated by consideration of high-speed cinefluorograms, and electromyograms from 9 articulatory locations, recorded while one subject produced 36 consonant–vowel–consonant monosyllables. In every possible case some aspect of the motor control of a later syllable component was influenced by the identity of the previous one. Except in a few cases, some aspect of the motor control of an earlier syllable component was influenced by the identity of the following one. Some of the context effects on phonemes could be accounted for by the 3-motor system mechanisms, but a number could not. The results suggested that syllabic factors are influential in the premotor command structure of speech, and that the CV form is a relatively cohesive component of CVC syllables. Author

N69-36119# Haskins Labs., Inc., New York.
STUDY OF NON-SPEECH VOLUNTARY PALATE

MOVEMENTS BY SCALING AND ELECTROMYOGRAPHIC TECHNIQUES

Ralph L. Shelton, Katherine S. Harris, George N. Sholes, and Patricia M. Dooley *In its* Speech Res. Jun. 1968 p 79–101 refs (See N69-36117 21-04)

Avail: CFSTI

This report concerns the voluntary, non-speech movements produced on command without the benefit of visual feedback or of the auditory feedback that would be associated with phonation. The study includes the subjects awareness of movement but not if he succeded in his attempt to complete the task. Results suggest that subjects learn to make voluntary palate elevations and these elevations agree fairly well with electromyographic measures. Results also suggest that these movements decrease under fatigue. E.H.W.

N69-36120# Haskins Labs., Inc., New York.

EXPERIMENTAL METHODS FOR SPEECH SYNTHESIS BY RULE

Ignatius G. Mattingly *In its* Speech Res. Jun. 1968 p 103–115 refs Presented at the Conf. on Speech Commun. and Process., Cambridge, Mass., 6–8 Nov. 1967 Submitted for publ. (See N69-36117 21-04)

Avail: CFSTI

An experimental system for speech synthesis by rule was developed which consists of a resonance synthesizer, a DDP-224 digital computer, associated peripheral devices, and two computer programs. The objectives of the design were flexibility, suitability for computer control, and reliability. For the flexibility the resonant circuits are in parallel. Reliability was achieved with the recent advances in electronics. Author

N69-36121# Haskins Labs., Inc., New York.

A SIMPLE PROGRAM FOR SYNTHESIZING BRITISH ENGLISH

Mark P. Haggard and Ignatius G. Mattingly *In its* Speech Res. Jun. 1968 p 117–129 refs Presented at the Conf. on Speech Commun. and Process., Cambridge, Mass., 6–8 Nov. 1967 Submitted for publ. (See N69-36117 21-04)

Avail: CFSTI

A procedure for synthesizing British English was developed which incorporates certain economies at little apparent cost in intelligibility, and introduces some rules for allophones which improve quality. Tests are reported with intelligibility around 90 percent, and improvements suggested for the major sources of errors. The assumptions in the procedure for synthesizing speech by rule both summarize and suggest research on fundamental aspects of speech, and thus constitute a model for some aspects of speech production and speech perception. Author

N69-36122# Haskins Labs., Inc., New York.

RULES FOR WORD STRESS ANALYSIS FOR CONVERSION OF PRINT TO SYNTHETIC SPEECH

Jane H. Gaitenby *In its* Speech Res. Jun. 1968 p 131–141 refs Presented at the 74th Meeting of the Acoust. Oc. of Am., Miami Beach, Fla., 15 Nov. 1967 Submitted for publ. (See N69-36117 21-04)

Avail: CFSTI

An attempt to program a machine to amke its own phonetic judgments of the textual input without the aid of humans is proposed. To accomplish this, a clear cut set of rules for the conversion of printed letters to speech-like phones was undertaken. A test of nonsense words for humans to read was set up to determine how they stress unknown words. Results indicate that different amounts of stress are placed on different types of words, and that vowels play an important part in how much stress a word receives. From these observations a set of rules is being formulated for the conversion process. E.H.W.

N69-36123# Haskins Labs., Inc., New York.

DISCRIMINATION OF THREE-FORMANT NASAL-VOWEL SYLLABLES, PART 3

Erica Garcia *In its* Speech Res. Jun. 1968 p 143–153 refs (See N69-36117 21-04)

Avail: CFSTI

The identification of synthetic nasal-vowel syllables based on three-format vowel stimuli was discussed. It was found in experiments that labeling of synthetic nasals was equally sharp in CV and VC position, and that good labellers showed as abrupt a cross over from one nasal category to the other as was observed earlier in the case of voiced stops. Results agree reasonably well with predicted results. Author

N69-36186*# Research Triangle Inst., Durham, N.C. Engineering and Environmental Sciences Div.

APPLICATIONS OF AEROSPACE TECHNOLOGY IN AIR POLLUTION CONTROL Final Report, 15 Jun. 1968–14 Jun. 1969

19 Jun. 1969 65 p refs

(Contract NSR-34-004-056)

(NASA-CR-105548; RTI-EU-411-3) Avail: CFSTI CSCL 13B

The results of activities in the area of air pollution control are presented. This work is part of a feasibility program to determine the effectiveness of methods for transferring aerospace generated technology to non-aerospace problems and requirements. Forty-one specific technology related problems and requirements existing in programs of the National Air Pollution Control Administration were identified. Problem abstracts were prepared on 21 of these problems and computer information searches were completed. The problems and requirements which were investigated involve meteorological instrumentation, the effects of gaseous and particulate pollutants, detection instrumentation for both gaseous and particulate pollutants, process control for the elimination of pollutants, and chemical and thermal properties of pollutants. Author

N69-36204*# Naval Medical Research Inst., Bethesda, Md. Dept. of Microbiology.

EFFECTS OF HIGH AND LOW BAROMETRIC PRESSURES ON SUSCEPTIBILITY AND RESISTANCE TO INFECTION Quarterly Status Report, 1 Apr.–30 Jun. 1969

Francis B. Gordon and James D. Gillmore 30 Jun. 1969 14 p

(NASA Order R-21-010-010)

(NASA-CR-105586; A-3061A(AS-1); QSR-16) Avail: CFSTI CSCL 06S

Three experiments in which mice were subjected to simulated space cabin atmospheres (70% O_2 in N_2, 5 psia) before or after exposure to aerosol challenge with influenza virus did not confirm the impression obtained from an earlier experiment, i.e., that the 70% O_2 induced a more severe disease. The last three experiments gave evidence for a less severe infection in the simulated space cabin environment. A comparison of the evolution of the infection in the experiments with discrepant results shows a difference, and suggests that an unrecognized factor may be responsible, rather than random chance. Groups of hypoxic mice (air, 7.3 psia) were included in the experiments. Additional evidence was obtained for protection against influenzal infection by this environmental condition. In a single experiment influenza-infected mice exposed to hyperoxia (77% O_2, 1 atm) had a more severe infection than did the controls in air. By careful attention to standardization of all possible controllable factors in an experiment with A/HeJ mice in which pulmonary adenomas were induced by intravenous inoculation of dibenz-anthracene, a much better within-group range of variability was achieved. There was a 30% greater incidence of tumors in the mice exposed to 100% O_2 for 48 hours. Author

N69-36231*# Techtran Corp., Glen Burnie, Md.
CLINICAL RESEARCH ON THE RELATIONSHIP BETWEEN BASIC GUSTATORY SENSATIONS, GASTRIC SECRETION, GLYCEMIA, AND SENSE OF APPETITE [RICERCHE CLINICHE SUI RAPPORTI TRA SENSAZIONI GUSTATIVE FONDAMENTALI, SECREZIONE GASTRICA GLICEMIA E SENSE D'APPETITO]
Aldo Bellomo Washington NASA Sep. 1969 15 p refs Transl. into ENGLISH from Minerva Med. (Turin), v. 32, 1941 p 410–417
(Contract NASw-1695)
(NASA-TT-F-12513) Avail: CFSTI CSCL 06S

A presentation of mechanisms which influence gastric secretion and affect the appetite are given. It is shown that both the nervous and chemicohumoral systems act as stimuli to start secretion. Also examined are the influences of humoral, neurovegetative, and psychic mechanisms. Experiments were performed with human subjects. E.H.W.

N69-36271*# AiResearch Mfg. Co., Los Angeles, Calif. Dept. of Life Sciences.
MAN'S CAPABILITY FOR SELF-LOCOMOTION ON THE MOON. VOLUME 2: SUMMARY REPORT
E. C. Wortz, W. G. Robertson, L. E. Browne, and W. G. Sanborn Washington NASA Sep. 1969 85 p refs Revised
(Contract NAS1-7053)
(NASA-CR-1043; Rept-68-4262-Vol-2-Rev-1) Avail: CFSTI CSCL 06S

A comprehensive study of man's self-locomotive capabilities in simulated lunar gravity is presented. An inclined-plane and a gimbal-vertical simulator equipped with treadmills were used to simulate lunar gravity. Man's locomotive characteristics and the metabolic costs of walking, running, and loping at velocities from 2 to 12.8 km/hr were determined for subjects in pressurized Gemini-4C suits. The results showed that the energy cost of locomotion in simulated lunar gravity is considerably less than that in earth gravity. Ascending grades caused large increases in metabolic cost over that of level walking where the magnitude of the cost depends on the simulation technique used. Increasing the load carried from 75 to 400 earth pounds had a small and inconsistent effect on metabolic costs. Changing the smooth, hard walking surface to sandy soil caused a large increase in the metabolic cost at the higher locomotion rates. Author

N69-36294*# Neurosciences Research Program, Brookline, Mass.
NEURONAL FIBROUS PROTEINS: A REVIEW BASED ON TWO NRP CONFERENCES
Francis O. Schmitt and Frederick E. Samson, Jr. 15 Oct. 1968 110 p refs Sponsored in part by the Rogosin Foundation, and the Neurosciences Research Foundation *Its* Neurosci. Res. Prog. Bull., Vol. 6, No. 2
(Grants NsG -462; Nonr(G)-00014-68; NIH GM-10211-07)
(NASA-CR-105593) Avail: CFSTI CSCL 06P

Abstracts on neuronal fibrous proteins are presented, based on two conferences. Subjects include: (1) molecular biology of neuronal proteins, (2) general morphology of microtubules, (3) functional patterns of microtubules, (4) protein chemistry of microtubules, (5) characterization of microtubules, neurofilaments, and cross bridges in various neuronal types, (6) relations between neurofibrils, microtubules, and neurofilaments in degeneration, (7) fibrous constituents of cells, (8) physiocochemical properties of neurofilaments, (9) mechanochemical coupling in muscle, and (10) fibrous constituents in some pathological states. The tubular structures in sensory transduction is discussed, and a bibliography is included. F.O.S.

N69-36305*# University City Science Center, Philadelphia, Pa.
THE MOLECULAR BIOLOGY OF NITROGEN FIXING NODULES IN COMMON LEGUMES Annual Report
Elizabeth Thorogood 15 Jul. 1969 9 p
(Grant NGR-39-030-004)
(NASA-CR-105674) Avail: CFSTI CSCL 06C

An investigation into heme protein production in pea nodules was conducted. Of several peas investigated, the soybean seemed to produce more of the substance than the others. It also shows more stable qualities than other pea nodules, and seems to be easier to manipulate. In peas it was noted that the protein structure cannot hold onto the heme over long periods. Several methods for this process were also investigated, and it was concluded that the best method was to extract the substance in an atmosphere of carbon monoxide combined with hydrogen, extract the substance in mildly acid buffer, and dialyze the ammonium sulfate heme protein paste heme against Tris buffer. Distilled water must also be used in the process E.H.W.

N69-36350*# National Aeronautics and Space Administration, Washington, D.C.
FERTILIZABILITY OF THE EGG OF HYLA ARBOREA JAPONICA WITH SPECIAL REFERENCE TO THE CHANGE OF JELLY ENVELOPE
Ch. Katagiri Sep. 1969 11 p refs Transl. into ENGLISH from Zool. Mag. (Tokyo), v. 72, 1963 p 23–28
(NASA-TT-F-12333) Avail: CFSTI CSCL 06C

The change of the jelly envelopes of the egg of *Hyla arborea japonica* was studied in relation to the maintenance of its fertilizability. The egg is surrounded by a vitelline membrane and four layers of jelly envelopes. When inseminated, spermatozoa penetrating into the jelly come to a standstill upon contact with the jelly membrane. After a short pause of 1–2 seconds, they again start to penetrate through and reach the vitelline membrane. Fertilizability of the egg can be retained for a considerable time, at least six hours, in De Boer's solution, whereas in tap water it is retained at longest for 30 minutes and is completely lost within 45 minutes after immersion. It was found that spermatozoa cannot penetrate through the jelly membrane of the eggs pretreated for a long time with tap water. Author

N69-36366*# California Univ., Los Angeles. School of Medicine.
HISTOPATHOLOGICAL EVIDENCE FOR PULMONARY EMBOLI IN EXPERIMENTAL DECOMPRESSION SICKNESS DIAGNOSED BY RADIOISOTOPIC LUNG SCANNING
A. T. K. Cockett, S. M. Pauley, J. C. Saunders, and A. P. Roberts [1968] 10 p refs
(Grant NGL-05-007-003; Contract NRO-0014-66-CO295)
(NASA-CR-105591) Avail: CFSTI CSCL 06S

Mongrel dogs underwent experimental overcompression and decompression in test chambers at barometric pressures of 73.5 psig and 7 psig respectively. These tests proved lethal for the dogs, but provided useful information. The tests provide useful histopathological evidence for the presence of pulmonary embolization. The emboli was detected by serial scanning of the lung. A biopsy showed pulmonary edema and hemorrhage in the lung tissues. A biopsy of the cold areas was also performed. E.H.W.

N69-36378*# Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.
BIOPHYSICAL EVALUATION OF THE HUMAN VESTIBULAR SYSTEM Status Report, Jan. 1968–Jun. 1969
J. L. Meiry and L. R. Young Jun. 1969 40 p
(Grant NGR-22-009-156)
(NASA-CR-105596; MU-69-3) Avail: CFSTI CSCL 06S

The disparity between the experimentally evaluated time constants of objective and subjective responses to angular accelerations and the hydromechanical time constants of the

semicircular canals is accentuated by a rigorous analysis of the semicircular canals as a damped hydromechanical angular accelerometer. The dynamic response characteristics of the semicircular canals to angular acceleration are shown to be an order of magnitude faster than can be observed by nystagmus and subjective responses to vestibular stimulation. In addition, it is shown that roller pump action of the flexible canalicular duct can maintain an adequate pressure differential across the cupula to give it a constant deflection. This is physiologically equivalent to a constant angular acceleration stimulus, and offers a plausible explanation for the continuous nystagmus responses that are provoked by rotation at a constant angular velocity about an axis which is not colinear with an applied acceleration field. Author

N69-36419# Human Engineering Labs., Aberdeen Proving Ground, Md.

RADAR SYMBOLOGY STUDIES LEADING TO STANDARDIZATION: PART 2: DISCRIMINATION IN MIXED DISPLAYS

Jane C. Davis Mar. 1969 86 p refs

(AD-688125; HEL-TM-5-69) Avail: CFSTI CSCL 5/8

The report covers continued studies toward standardization coding symbols for an information display. Experiments were directed toward locating the most readily discriminated five-symbol code complex as measured by errors and location times. Experiment 1 attempted to simplify testing procedures by using a card sorting task. The same five-symbol code was presented as a black-on-white simulated display in Experiment 2. Results were not comparable and the simulated display was used in further experiments with a variety of codes. Legibility and association values of individual forms varied with the population of shapes within the code complex. Experimental results led to general recommendation for code design. Author (TAB)

N69-36433*# Oakland Univ., Rochester, Mich. School of Engineering.

BIOSYSTEMS ENGINEERING RESEARCH Quarterly Progress Report

J. E. Gibson, R. H. Edgerton, R. E. Haskell, and J. C. Hill 30 Jul. 1969 51 p refs

(Grant NGR-23-054-003)

(NASA-CR-105653; QPR-1) Avail: CFSTI CSCL 06B

Equations of motion were derived by means of the Lagrange equations for a seven-element stick man, part of a postural control system. Experiments to determine the force–velocity characteristics of human muscles are mentioned in this connection. Work is described on two problems related to bio-optics. The first study deals with the design of a continuously variable focusing system which could be used either to replace bifocal lenses, allow bifocal contact lenses, or provide an artificial cornea. The second study is an attempt to describe and model the cornea. Liquid crystals were tentatively chosen as the media for these purposes because their sensitive optical properties can be readily altered by magnetic, electrical, or mechanical means. An exploratory study was made of the use of coherent optical processing techniques for the rapid analysis of large quantities of experimental biological data. The approach is to characterize biological photomicrographs as random signals from which quantitative statistical information can be obtained. Power spectrum and autocorrelation measurements made for the purpose of this study are described, and a lensless optical processor for signal analysis was designed. K.W.

N69-36436*# George Washington Univ., Washington, D.C. Medical Center.

SCIENTIFIC PUBLICATIONS OF THE BIOSCIENCE PROGRAMS DIVISION. VOLUME 3: EXOBIOLOGY, SECOND EDITION

Frances Hong and Jean Pulliam 31 Aug. 1968 154 p refs

(Contract NSR-09-010-027)

(NASA-CR-103224) Avail: CFSTI CSCL 06C

This volume contains 715 citations arranged chronologically and alphabetically by author. Publications appearing in serial literature, monographs, and books during the period from 1960 through 1967 are listed. The information is also presented in the rearranged form of a permuted title index, an author index, and a listing of senior authors and laboratory addresses. A list of journals publishing exobiology articles is included. K.W.

N69-36471# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

BLASTOMOGENIC PROPERTIES OF INDUSTRIAL METALS AND THEIR COMPOUNDS

P. P. Dvizhkov 6 Mar. 1969 21 p refs Transl. into ENGLISH from Arch. Patol. (Moscow), v. 29, no. 3, 1967 p 3–11

(AD-688689; FTD-MT-24-452-68) Avail: CFSTI CSCL 6/10

A review of the literature on some important industrial metals and their compounds (chromium, nickel, cobalt, beryllium, zinc, iron, aluminum, and metallic mercury) with special reference to their effects on the lungs indicated that some of the metals (nickel and chromium) are definitely blastomogenic, while others (beryllium and cobalt) are potentially so. Iron, zinc, and aluminum have not been clearly implicated. The author notes the spareness of studies on morphological changes in humans and animals after exposure to the metals. Little attention has been paid to the pretumor, initial, and subsequent stages of the disease. There is also need for cytological studies. Author (TAB)

N69-36476# Joint Publications Research Service, Washington, D.C.

PROBLEMS OF WEIGHTLESSNESS DISCUSSED

10 Jul. 1969 23 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 3, 1969 p 323–338

(JPRS-48383) Avail: CFSTI

CONTENTS:

1. SOME PROBLEMS OF WEIGHTLESSNESS IN SPACE MEDICINE (A SURVEY) P. V. Vasilyev et al p 1–15 refs (See N69-36477 21-04)

2. SIMULATION OF MAN'S MOVEMENTS IN WEIGHTLESSNESS AND IN A WATER ENVIRONMENT FROM BIOMECHANICAL POSITIONS N. F. Chekirda et al p 16–22 refs (See N69-36478 21-04)

N69-36477# Joint Publications Research Service, Washington, D.C.

SOME PROBLEMS OF WEIGHTLESSNESS IN SPACE MEDICINE A Survey

P. V. Vasilyev et al *In its* Probl. of Weightlessness in Space 10 Jul. 1969 p 1–15 refs (See N69-36476 21-04)

Avail: CFSTI

Space flights lasting up to two weeks induce a number of autonomic changes referable to the main physiological systems that are not pathological and that are indicative of development of compensatory-adaptive reactions in the organism under unusual living conditions. At different stages of space flight, changes are noted in parameters characterizing the function of the cardiovascular system, respiration, as well as metabolism and expenditure of energy. The extent of such reactions is determined largely by the individual distinctions of the astronauts. The results of laboratory investigations indicate that it is possible, using a number of physical methods and pharmacological agents, to increase orthostatic stability and resistance to G-forces during the period following prolonged hypodynamia and immersion. Author

N69-36478# Joint Publications Research Service, Washington, D.C.

SIMULATION OF MAN'S MOVEMENTS IN WEIGHTLESSNESS AND IN A WATER ENVIRONMENT FROM BIOMECHANICAL POSITIONS

N. F. Chekirda et al *In its* Probl. of Weightlessness in Space 10 Jul. 1969 p 16-22 refs (See N69-36476 21-04)

Avail: CFSTI

A cyclogrammetric study was made of internal coordination structure of slow and rapid movements of the human hand under conditions of weightlessness, under the ordinary force of gravity, and when immersed in water. Biomechanical analysis was made of formation of movements under various environmental conditions. It was established that in a water environment the internal coordinational structure of movements is more complex than under the usual force of gravity and in weightlessness. There are negligible differences in slow movements with respect to muscular exertion and appearance in water and weightlessness. This permits successful simulation in water of performance of the meaningful aspect of professional work operations and the sequence of their performance in space. Author

N69-36483# George Washington Univ., Alexandria, Va. Human Resources Research Office.

FACTORS IN PREDICTING ARMY AVIATOR PERFORMANCE: BIRTH ORDER AND PARTICIPATION IN DANGEROUS SPORTS AND ACTIVITIES

Peter R. Prunkel May 1969 15 p refs Presented at Southeastern Psychological Assoc. Ann. Meeting, New Orleans, Feb. 1969

(Contract DAHC19-69-C-0018)

(AD-688812; HumRRO-PP-13-69) Avail: CFSTI CSCL 5/10

From previous research it was hypothesized that firstborns would tend to avoid the potential dangers of Army aviation, but that firstborn-volunteers would not differ from later-born volunteers in terms of previous participation in dangerous sports and activities. Data were used from the Background Activities Inventory of 395 aviation warrant officer trainees, to test for birth-order effect by comparing first- and second-borns from the same-size families. Although there were significantly more first- than second-borns, reasons that the finding may be spurious are discussed. First- and second-born trainees did not differ on measures of exposure to dangerous sports and activities or confidence. Neither pass-fail from flight training nor previous college attendance showed a birth-order effect. Author (TAB)

N69-36486*# Cornell Univ., Ithaca, N.Y.

NATURAL SELECTION OF MICROORGANISMS IN EXTREME ENVIRONMENTS Final Report

M. Alexander Jul. 1969 9 p

(Grant NGR-33-010-013)

(NASA-CR-105657) Avail: CFSTI CSCL 06M

The natural selection of microorganisms exposed to drought and starvation was studied by isolating bacteria susceptible and resistant to these extreme environmental conditions, and the ability of each to survive under environmental stress was examined. The spore formers were eliminated by heat treatment. The organisms that survived the drought stress for more than 15 days were considered as resistant and those that perished within one to four days were designated susceptible. It was found that: certain gram negative rods were capable of maintaining viability for periods of 60 days; the resistance to drought was effected by the age of the organisms; and the ability to resist extreme dryness increased after adaptation by mutation or nongenetic changes. The starvation-resistant bacteria were found to have a high content of PHB, whereas the PHB level in the susceptible cells was uniformly low. F.O.S.

N69-36545# Israel Program for Scientific Translations, Ltd., Jerusalem.

VEGETATION OF THE FAR NORTH OF THE USSR AND ITS UTILIZATION. PART 6: VASCULAR PLANTS OF THE SIBERIAN NORTH AND THE NORTHERN FAR EAST

B. A. Tikhomirov ed. et al 1969 341 p refs Transl. into ENGLISH from the book "Rasteniya Severa Sibiri i Dalnego Vostoka. Part 6: Rastitelnost Krainego Severa SSSR i ee Osvoenie" Moscow, Nauka, 1966 Published for US Dept. of Agr. and NSF *Its* Cat. No. 5133

(TT-68-50340) Copyright. Avail: CFSTI

CONTENTS:

1. THE FLORA OF TIKSI BAY (ARTIC YAKUTIA) B A. Tikhomirov et al p 4-50 refs (See N69-36546 21-04)

2. A LIST OF VASCULAR PLANTS OF MUOSTAKH ISLAND (BUORKHAYA BAY, ARCTIC YAKUTIA) O. V. Rebristaya p 51-54 ref (See N69-36547 21-04)

3. VASCULAR PLANTS OF AION ISLAND (CHAUN BAY) V. R. Filin et al p 55-73 refs (See N69-36548 21-04)

4. THE FLORA OF THE BERING COAST OF CHUKCHI PENINSULA B. A. Tikhomirov et al p 74-105 refs (See N69-36549 21-04)

5. FLORA OF THE EXTREME EAST OF CHUKCHI PENINSULA (UELEN TOWN-CAPE DEZHNEV) T. G. Derviz-Sokolova p 106-144 refs (See N69-36550 21-04)

6. THE FLORA OF THE VERKHOYANSK MOUNTAINS I. D. Kildyushevskii p 145-164 refs (See N69-36551 21-04)

7. FLORA OF THE VICINITY OF THE EXCAVATION OF THE TAIMYR MAMMOTH B. A. Tikhomirov p 165-181 refs (See N69-36552 21-04)

8. FLORA OF THE MOUNTAIN AND PLAIN TUNDRAS AND OPEN FORESTS OF THE URALS K. N. Igoshina p 182-340 refs (See N69-36553 21-04)

N69-36546# Israel Program for Scientific Translations, Ltd., Jerusalem.

THE FLORA OF TIKSI BAY (ARCTIC YAKUTIA)

B. A. Tikhomirov et al *In its* Vegetation of the Far North of the USSR and its Util., Pt. 6 1969 p 4-50 refs (See N69-36545 21-04)

Copyright. Avail: CFSTI

Information concerning the flora in the vicinity of the town of Tiksi, located in the lower area of the Lena River, is presented. Following a brief physico-geographical description of the region, the topographical distribution and types of plant life are treated. In defining the latitudinal-geographical features, the flora are designated as Arctic in type; the specific character is considered plain-mountain or coastal-mountain. A.C.R.

N69-36547# Israel Program for Scientific Translations, Ltd., Jerusalem.

A LIST OF VASCULAR PLANTS OF MUOSTAKH ISLAND (BUORKHAYA BAY, ARCTIC YAKUTIA)

O. V. Rebristaya *In its* Vegetation of the Far North of the USSR and its Util., Pt. 6 1969 p 51-54 ref (See N69-36545 21-04)

Copyright. Avail: CFSTI

A list of plants collected on Muostakh Island, situated in Buorkhaya Bay near Tiksi, is given. The island is made up of a strip of dry land about 19 km in length and 0.2 to 10 km in width, extending longitudinally NNW to SSE. Originally joined to the mainland as part of the Bykov Peninsula, it became detached under the action of strong seas and is characterized by the presence of a fossil-ice stratum concealed beneath a soil layer in all except the northern extremity. Nearly all of the surface is covered by polygonal mud-crack bogs in different stages of development, the disintegration of which results in the formation of

hummock-baidzharakhi plants over the littoral area of the island. The moss and low-shrub patchy tundras characteristic of the Tikso area are not present. A.C.R.

N69-36548# Israel Program for Scientific Translations, Ltd., Jerusalem.
VASCULAR PLANTS OF AION ISLAND (CHAUN BAY)
V. R. Filin et al *In its* Vegetation of the Far North of the USSR and its Util,, Pt. 6 1969 p 55–73 refs (See N69-36545 21-04)
Copyright. Avail: CFSTI

A list of plant life on Aion Island is presented, as represented by a 1958 expedition along the western and southern coasts and specimens collected prior to that date. The island is essentially a low plain with many rivers and lakes composed of Quaternary lacustrine-alluvial loamy deposits; the northwest, central and several other areas are characterized by sandy deposits forming low dunes. The southern and western coasts break off abruptly at the sea as steep escarpments separated from the waterline by sandy or silty marine terraces. The climate is maritime, and widely distributed areas of permafrost are found. Vegetation is represented by various tundra formations, of which polygonal sedge-hypnum bogs are widespread in regions of low relief. A.C.R.

N69-36549# Israel Program for Scientific Translations, Ltd., Jerusalem.
THE FLORA OF THE BERING COAST OF CHUKCHI PENINSULA
B. A. Tikhomirov et al *In its* Vegetation of the Far North of the USSR and its Util., Pt. 6 1969 p 74–105 refs (See N69-36545 21-04)
Copyright. Avail: CFSTI

The results of research over the period 1956–1958 and in 1962 are discussed as related to the flora and vegetation in thermal springs and that in other parts of the peninsula's eastern coast. A brief historical account is given of expeditions into this area, which is of particular interest in analyzing American-Asiatic biological links and has significant influence on Arctic flora and fauna. The topography of the region is also treated, since the Asiatic shore of the Bering Sea, dissected by numerous fjord-shaped bays receiving the mass flow from small rivers and streams, affords an excellent base for plant settlement of the Chukchi mountain system. At the same time, the open beaches of the Bering Sea provide a sanctuary for plants whose settlement is related to the presence of sea waters. The diverse ecological conditions and the open habitats thus give unlimited possibilities for species migration and enable the existence of contemporary floral species as well as plants from previous epochs. A.C.R.

N69-36550# Israel Program for Scientific Translations, Ltd., Jerusalem.
FLORA OF THE EXTREME EAST OF CHUKCHI PENINSULA (UELEN TOWN-CAPE DEZHNEV)
T. G. Derviz-Sokolova *In its* Vegetation of the Far North of the USSR and its Util., Pt. 6 1969 p 106–144 refs (See N69-36545 21-04)
Copyright. Avail: CFSTI

Results of 1958 and 1959 summer expeditions are described, which provide a more complete characterization of the area and give new information on the flora of both the Chukchi Peninsula and the U.S.S.R. as a whole. Brief notes are included on the ecology and biology of the individual species; for rare species, information is also given on the place and date of collection, as well as the phenologic phase. The studies were confined to a small area in the easternmost corner, from the town of Inchoun to Puoten Bay. Collections were made in valley tundras, on slopes of small unknown sopkas, and on the slope of Uelenei sopka, which forms the northwestern part of the Dzhnev massif. The physico-geographical features of the area are described, and the types of habitat are classified based on geomorphological conditions. This classification resulted from the observation that plant associations are constantly under the influence of excessive moisture conditions, and that the content of soil moisture in the area large depends upon local relief. Families and genera of flora are listed according to Engler's classification and their general characteristics analyzed. A.C.R.

N69-36551# Israel Program for Scientific Translations, Ltd., Jerusalem.
THE FLORA OF THE VERKHOYANSK MOUNTAINS
I. D. Kildyushevskii *In its* Vegetation of the Far North of the USSR and its Util., Pt. 6 1969 p 145–164 refs (See N69-36545 21-04)
Copyright. Avail: CFSTI

An analysis of plant collections made in the Tompo District along the upper reaches of the Tompo, Narigandy, and Bryungyade rivers is presented. Species from previous expeditions are also included in order to obtain a more exhaustive representation and to fill in a gap in knowledge concerning the overall flora population of the Verkhovansk Range. The investigated region has a mountainous terrain rising to a height of 2000 m above sea level, with individual peaks up to 2500 m. The greater part of the area is situated above the timberline and comprises screes almost devoid of vegetation. Lichens and low shrub growth only develops on the more gentle slopes. The small river valleys are widely distributed with high terraces of lichen tundras; lower areas have terraces with low shrub tundras. Along the river channel there is usually a wide belt of pebbles with willow growth. A list of 267 collected species and their distribution is included. A.C.R.

N69-36552# Israel Program for Scientific Translations, Ltd., Jerusalem.
FLORA OF THE VICINITY OF THE EXCAVATION OF THE TAIMYR MAMMOTH
B. A. Tikhomirov *In its* Vegetation of the Far North of the USSR and its Util., Pt. 6 1969 p 165–181 refs (See N69-36545 21-04)
Copyright. Avail: CFSTI

The results of an expedition to the Taimyr Peninsula, the northernmost European and global continental promontory, are presented. The area in which the Taimyr mammoth was found was chosen for the sample collection, since no botanist had visited it before. The plant associations are characterized in general terms to give a clearer understanding of the origins and development of the flora. The principal plant groupings are classified as follows: (1) cottongrass-moss tundras; (2) cottongrass-sedge patchy moss tundras, which constitute a stage in the disintegration process of preceding associations under the effect of solifluction and patch formation; (3) dryad-sedge moss patchy tundras, representing a further stage in plant aggregation evolution that occurs only on sectors with better drainage; and (4) sedge-willow moss patchy tundras, also considered as a stage in the degradation of cottongrass tundras. A list of 118 species collected during the expedition is given. It was concluded that the relatively profound transformation of plant cover observed was caused by a corresponding alteration of the entire physico-geographic complex; in late post-glacial times, this proved too severe for the continued existence of many plants. A.C.R.

N69-36553# Israel Program for Scientific Translations, Ltd., Jerusalem.
FLORA OF THE MOUNTAIN AND PLAIN TUNDRAS AND OPEN FORESTS OF THE URALS

K. N. Igoshina *In its* Vegetation of the Far North of the USSR and its Util., Pt. 6 1969 p 182–340 refs (See N69-36545 21-04)
Copyright. Avail: CFSTI

A list of flora, based on collections in a Soviet botanical herbarium and those obtained from expeditions covering the period 1925–1965, is presented. A brief historical account is also given of previous investigations in the Urals from the 18th century to the modern era. The list includes 769 species of 245 genera pertaining to 53 families; it encompasses the flora of Ural mountain and plain tundras, as well as those of mountain and plain open-forest zones extending to the borders of the closed forest. Over a range of 2000 km from north to south, the area and character of the goltsys with high-mountain flora exhibit marked change. For this reason, five sectors, as adopted by geologists, are used in reviewing the distribution of plant species. A.C.R.

N69-36660# Atlantic Research Corp., Alexandria, Va.
THE FLAMMABILITY OF SKIN AND HAIR IN OXYGEN-ENRICHED ATMOSPHERES Final Report, 1 Nov. 1967–1 Jun. 1968
Robert L. Durfee Brooks AFB, Tex. AF School of Aerospace Med. Dec. 1968 41 p refs
(Contract F41609-68-C-0013)
(AD-688920; SAM-TR-68-130) Avail: CFSTI CSCL 13/12

The flammability of hair and skin from white suckling pigs and from humans was studied in atmospheres ranging in oxygen concentration from 20.9% (air) to 100%. Neither pigskin nor human skin would support combustion in pure oxygen at 258 mm. Hg except in the presence of an artifact consisting of exposed subdermal fat and local depletion of heat sink capability. Although pig bristles and human hair burn rapidly in pure oxygen, differences observed in flame spead rates and burning times indicate that skin of suckling pigs is not an adequate simulant for human skin in terms of response to an ignition source in pure oxygen. Methods of protection against ignition were studied with pigskin samples. The helium concentration necessary to prevent flame spread at 1 atm. total pressure is 75% by volume. Salves and creams are effective against flame spread when the amounts applied are much larger than those normally used. The values obtained from the present work on unshaved pigskin samples to determine flame spread rate and critical helium concentration (for zero flame spread) are completely consistent with reported values for other types of combustibles. Author (TAB)

N69-36709*# Environmental Research Associates, Randallstown, Md.
STUDY OF THE ASTRONAUT'S CAPABILITIES TO MAINTAIN LIFE SUPPORT SYSTEMS AND CABIN HABITABILITY IN WEIGHTLESS CONDITIONS
Harry L. Loats, Jr., George M. Hay, and Edwin Morris Washington NASA Aug. 1969
(Contract NAS1-7887)
(NASA-CR-1405; ERA-68-1) Avail: CFSTI CSCL 06S

The main emphasis during the program was to determine the applicability of various restraint and locomotion aids related to the performance of a variety of critical intravehicular tasks. Although the exact nature of future space station missions and hardware is not fully defined at present, certain important characteristics are indicated. Specific characteristics of the tasks were investigated and included: maintenance and repair of life support systems; working at a work bench, a standup platform, a work station, and a control console: locomotion about the interior of the compartment, data collection tasks including writing and calculations, cargo handling and storage, and general and housekeeping tasks. Author

N69-36719# Naval Aerospace Medical Inst., Pensacola, Fla.
ACQUIRED BUNDLE BRANCH BLOCK IN THE NAVAL AVIATOR POPULATION
Raphael F. Smith, David H. Jackson, J. Warren Harthorne, and Charles A. Sanders 28 Feb. 1969 14 p refs
(AD-688118; NAMI-1062) Avail: CFSTI CSCL 6/5

Twenty-eight naval aviators (median age 40 years) whose electrocardiograms changed from a normal pattern to bundle branch block were studied in order to assess the attendant risk. Twenty-two of the men had right bundle branch block (RBBB) and six had left bundle branch block (LBBB). In 25 men the abnormality was noted on a routine ECG at the time of annual physical examination. Follow-up information was available for all members of the group and represented 100 patient-years of observation. Selective coronary angiography was done in seven men and coronary artery disease was noted in one patient with LBBB. Six men had normal coronary arteries. One patient, age 44, died eight months after his ECG changed to RBBB. Extensive coronary artery disease was present at autopsy. A total of three men in the bundle branch block group had definite evidence of coronary heart disease. In two men RBBB appeared after chest trauma. The prevalence of coronary heart disease was higher in the bundle branch block group than in a cohort of 649 naval aviators of similar age. In 23 of the men the etiology of the bundle branch block was not determined. It is concluded that acquired bundle branch block is frequently, but not invariably, associated with a good prognosis in the young male patient. Author (TAB)

N69-36741*# California Univ., Berkeley.
CO-EXISTENCE OF LIPID AND GAS EMBOLI IN EXPERIMENTAL DECOMPRESSION SICKNESS
A. T. K. Cockett, S. M. Pauley, J. C. Saunders, and F. M. Hirose [1968] 9 p refs
(Grant NGR-05-007-003; Contract NRO-0014-66-C0295)
(NASA-CR-105751) Avail: CFSTI CSCL 06S

Tissue sectioning was performed on the lungs of mongrel dogs overcompressed to 165 feet, maintained at depth for 60 minutes, and then decompressed to surface. Oil-red-O stains were made of treated and untreated animals. Treatment consisted of dextran or intravenous heparin. The results show: (1) Lipid embolization appears to play a major role in the genesis of decompression sickness. (2) Evidence is found for the coexistence of lipid emboli and gaseous emboli. (3) Heparin or dextran, effective lipemic clearing agents, are beneficial in treating experimental decompression sickness. (4) A combinded therapeutic approach, using recompression and dextran, should be employed in treating human decompression sickness. Heparin may serve as a substitute in selected instances. Author

N69-36773*# Techtran Corp., Glen Burnie, Md.
THE EFFECT OF VITAMINS B1 AND B2 (LACTOFLAVIN) ON THE WATER TEST AMONG NORMAL CHILDREN [DIE WIRKUNG DER VITAMINE B1 UND B2 (LACTOFLAVIN) AUF DIE WASSERPROVE BEI NORMALEN KINDERN]
I. Gatto Washington NASA Sep. 1969 7 p refs Transl. into ENGLISH from Klin. Wochschr. (Berlin), v. 18, 1939 p 303–305
(Contract NASw-1695)
(NASA-TT-F-12502) Avail: CFSTI CSCL 06P

This article discusses the effect of vitamins B_1 and B_2 (lactoflavin) on the water test among normal children. The results of these examinations among normal children can be summarized as follows: 1. Vitamin B_1 does not show any effect on the water test. 2. Vitamin B_2 results in a reduced diuresis during the hour following the administration of the vitamin; however, this effect is compensated during the second and third hours of the water test. 3. Vitamin B_2 has the same effect on the Salyrgan and Diuretin diuresis. Author

N69-36774*# Techtran Corp., Glen Burnie, Md.
THE BEHAVIOR OF BLOOD SUGAR LEVELS DURING REPEATED AND VARIOUS KINDS OF ENTERIC SUGAR SUPPLY AND ITS SIGNIFICANCE FOR THE FUNCTION OF THE LIVER [UBER DAS VERHALTEN DES BLUTZUCKERSPIEGELS BEI WIEDERHOLTER UND VERSCHIEDENER ART ENTERALER ZUCKERZUFUHR UND DESSEN BEDEUTUNG FUR DIE LEBERFUNKTION]
Karl Traugott Washington NASA Sep. 1969 6 p ref Transl. into ENGLISH from Klin. Wochschr. (Berlin), v. 1, no. 18, 29 Apr. 1922 p 892–894
(Contract NASw-1695)
(NASA-TT-F-12516) Avail: CFSTI CSCL 06P

Liver function in sugar utilization is studied by testing blood sugar level in a large population after injection of 100 g dextrose or levulose. It is observed that following the enteric introduction of a nutriment so suitable for the body as dextrose, results occur that are otherwise seen usually only in the case of parenteral introduction of alien substances, such as for example, a rejection of a rather large amount of albumen goes along with an increased degree of albumen breakdown. Author

N69-36776# School of Aerospace Medicine, Brooks AFB, Tex.
BIOASTRONAUTICS AND THE EXPLORATION OF SPACE
Conference Proceedings
Charles H. Roadman, ed., Hubertus Strughold, ed., and Roland B. Mitchell, ed. Nov. 1968 610 p refs Presented at the 4th Intern. Symp., San Antonio, 24–27 Jun. 1968
(Contract AF 41(609)-67-C-0034)
(AD-687893) Avail: CFSTI CSCL 6/3

Conference papers are presented on the development of aerospace medicine, and the relationship between astronautics and planetary exploration. For individual titles, see N69-36777 through N69-36803.

N69-36779# California Univ., La Jolla.
SOME REMARKS ON THE EVOLUTION OF THE ATMOSPHERES AND THE OCEANS
Harold C. Urey *In* School of Aerospace Med. Bioastronaut. and the Exploration of Space Nov. 1968 p 25–45 refs (See N69-36776 21-04)
(UCSD-34) Avail: CFSTI

Recent chemical, paleontological, and biological evidence on the evolution of the earth's atmosphere and oceans is presented. Topics include: the origin of the earth; its early surface; composition of the primitive atmosphere and oceans; variation of the atmosphere with time; and the origin of life. A.C.R.

N69-36780*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CHEMICAL EVOLUTION AND THE ORIGIN OF LIFE
Cyril Ponnamperuma *In* School of Aerospace Med. Bioastronaut. and the Exploration of Space Nov. 1968 p 47–61 refs (See N69-36776 21-04)
Avail: CFSTI CSCL 06C

Experimental laboratory research into the chemical sequence of events which led to the appearance of the first replicating molecules is summarized, and it is shown that these two stages could have taken place on the primordial earth before the appearance of life. The two events are: (1) origin of the micromolecules, or monomers; and (2) condensation of the micromolecules into macromolecules, or polymers, capable of replication. Specific experiments were aimed at simulation of primitive atmospheres, and condensation reactions. These procedures indicated that wherever suitable conditions exist, organic compounds of biological significance can be synthesized. These results lend support to the hypothesis of chemical evolution and to belief in the existence of extraterrestrial life. A.C.R.

N69-36782# Universidad Peruana de Ciencias Medicas y Biologicas, Lima (Peru).
THE ANDEAN MAN
Alberto Hurtado *In* School of Aerospace Med. Bioastronaut. and the Exploration of Space Nov. 1968 p 83–93 refs (See N69-36776 21-04)
Avail: CFSTI

The adaptive processes required for the existence of prehistoric Andean civilization at altitudes up to 4200 m are discussed in light of recent research into high altitude physiological responses. It is emphasized that hypoxia is the most critical factor in human adaptation to such an environment. The adaptive process is considered in two categories: (1) those which act along the total pO_2 gradient, from inspired air to mixed venous blood, introducing a large economy in the fall of the gradient; and (2) those which operate at tissue level, favoring the acquisition and utilization of oxygen. Several clinical aspects of these processes are briefly mentioned, and it is recommended that further study be made into this type of acclimatization, due to lack of uniform agreement regarding the pathogenesis of some of the adaptive processes. A.C.R.

N69-36784# School of Aerospace Medicine, Brooks AFB, Tex.
LIFE SUPPORT (SURVIVAL) IN SPACE
A. G. Swan *In its* Bioastronaut. and the Exploration of Space Nov. 1968 p 113–132 refs (See N69-36776 21-04)
Avail: CFSTI

The requirements for survival during prolonged space flights are discussed, and the factors involved in space environmental control are analyzed. The term environment in this context is defined as the atmosphere, gravitational forces, and solar radiation. Weightlessness conditions, one of the primary environmental concerns of future space flight, is treated as to its physiological effects and methods of counteracting them. A list of tolerable atmospheres for selection, and possible contaminants from the crew, materials, and equipment malfunctions are suggested. Mention is also made of the problems of oxygen toxicity, rapid decompression, and fire hazards. It is concluded that improved technology, coupled with increased flight experience during recent years, enables the undertaking of manned flights of 30 to 45 days with reasonable assurance of survival. It is also recommended that animal flights of 90 to 180 days be initiated, giving particular attention to studying cellular effects caused by total space environment for prolonged periods. A.C.R.

N69-36787# Air Force Systems Command, Washington, D.C.
BIOASTRONAUTICS AND ORBITING SPACE STATIONS
James Ferguson *In* School of Aerospace Med. Bioastronaut. and the Exploration of Space Nov. 1968 p 179–189 (See N69-36776 21-04)
Avail: CFSTI

The physiological and psychological problems related to man's adaptation to the space environment are discussed, and the economic feasibility of initiating a manned orbital space station within the next decade is treated from the viewpoint of overall national priorities. The technical achievements toward realization of a space station during the past few years are reviewed, as well as several programs designed to contribute a better knowledge of the factors involved in such an undertaking. Included are the S IV B workshop and studies leading toward a Manned Orbiting Laboratory (MOL). Economic consideration involved in assuring the

survival and health of astronauts during their assignment to a space station are evaluated. Particular attention is given to the recommended duration of the mission, station size, extent of automated equipment, simulation of earth atmospheric conditions, and weightlessness. A.C.R.

N69-36788*# National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Tex.
ORBITAL FLIGHT RESULTS
Charles A. Berry *In* School of Aerospace Med. Bioastronaut. and the Exploration of Space Nov. 1968 p 191–211 refs (See N69-36776 21-04)
Avail: CFSTI CSCL 06S

Physiological responses and changes in man's functional capabilities during orbital flight are summarized, based on information collected from the Mercury, Gemini, and Apollo Programs. Significant features of the space environment which must be taken into account include the zero gravity state, an altered ionizing radiant flux from that encountered within the earth's atmosphere; and an altered exposure to sunlight and darkness. The physiological effects of extravehicular activity are also considered. Finally, steps toward longer duration flights, such as envisioned by the Apollo Applications Program in the form of a manned orbiting workshop, are discussed, and suggestions are made for the biomedical data which could be gained from such a project. It is concluded that the health and adaptation of astronauts cannot yet be predicted for flights durations of more than six months, and that orbital missions for this purpose should be conducted with at least six crewmen in order to achieve an adequate sampling. A.C.R.

N69-36794# School of Aerospace Medicine, Brooks AFB, Tex.
THE HUMAN EYE IN SPACE EXPLORATION
James F. Culver *In its* Bioastronaut. and the Exploration of Space Nov. 1968 p 387–397 refs (See N69-36776 21-04)
Avail: CFSTI

Weightlessness and its effects on vision are discussed and related to visual requirements for lunar landing and exploration under the Apollo program. Past experiences in manned space flight have demonstrated that the astronaut can adapt to changes in lighting and difficulties in distance judgment. Two inputs are needed: (1) the absolute size of the viewed object; and (2) the rate of closure. If both or either is known, proper training results in accurate distance judgment utilizing other cues. A.C.R.

N69-36795# School of Aerospace Medicine, Brooks AFB, Tex. Plans and Operations Div.
BIODYNAMIC ENVIRONMENTS IN SPACEFLIGHT
Neville P. Clarke *In its* Bioastronaut. and the Exploration of Space Nov. 1968 p 399–419 refs (See N69-36776 21-04)
Avail: CFSTI

When the effects of mechanical forces associated with space flight on crewmen are evaluated, two sets of boundary conditions are pertinent: (1) those which establish the mechanical force environments; and (2) those which establish human limits to survive and perform adequately in these environments. This complex relation between man and the space system he operates is analyzed, with attention focused on two major effects of biodynamic environments on human performance. These are: (1) effects of increasingly longer exposure to weightlessness and other factors on subsequent response; and (2) effects of extremely sustained conditions of acceleration, vibration, and impact forces which occur under emergency conditions. It is concluded that biodynamic environments predicted for nominal performance on future missions are not necessarily more severe than those encountered on previous flights. The major unknown factor in prolonged missions appears to be the potential effects of confinement and weightlessness on the cardiovascular and musculoskeletal systems. A.C.R.

N69-36796# School of Aerospace Medicine, Brooks AFB, Tex. Environmental Physiology Div.
NUTRITION FOR LONG SPACE VOYAGES
John E. Vanderveen *In its* Bioastronaut. and the Exploration of Space Nov. 1968 p 421–430 refs (See N69-36776 21-04)
Avail: CFSTI

Nutrient deficiencies and actual tissue losses evidenced from the Mercury and Gemini flights demonstrated the need for careful planning of the space crew's diet on an individual basis. Individual planning is necessary because nutrient requirements vary from person to person, although methods of establishing these needs are difficult to establish. Greater attention must also be placed on vitamin and trace element requirements of astronauts, a factor which at the present time is ill-defined. The importance of food acceptance in long space voyages is also considered, due to its effect on total consumption. Finally, storage problems are treated for missions up to 120 days, for which dehydrated foods similar in composition to those used in the Apollo program can be used, as well as those associated with longer flights. It is anticipated that chemical and bioregeneration systems will probably have greater efficiency than carry-aboard foods for the latter missions. A.C.R.

N69-36798# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biodynamics and Bionics Div.
BIONICS: ITS ROLE AND FUTURE IN SUPPORT OF ASTRONAUTICS
Henning E. von Gierke *In* School of Aerospace Med. Bioastronaut. and the Exploration of Space Nov. 1968 p 461–492 refs (See N69-36716 21-04)
Avail: CFSTI

A review of the status of bionics/biocybernetics research and its potential contributions to astronautics is presented. It is suggested that human recognition capability and control can be replaced step-by-step by machine recognition devices and self-adaptive computers. The applied physical sciences will be penetrated more and more deeply with biological concepts, ideas and capabilities. The biological roots of the functional capabilities and of the expressions used to describe them will be forgotten with the use of automatic learning systems. It is thus concluded that biological research today no longer serves exclusively the direct support of man, but has potential impact on nearly every area of modern technology. The challenge of the self-contained microworld of space requires close coupling between man and the machines built to assist him and between the biomedical and physical-engineering disciplines. A.C.R.

N69-36799# School of Aerospace Medicine, Brooks AFB, Tex.
PLANETARY ENVIRONMENTAL MEDICINE (MARS)
Hubertus Strughold *In its* Bioastronaut. and the Exploration of Space Nov. 1968 p 493–509 refs (See N69-36776 21-04)
Avail: CFSTI

The medical aspects of interplanetary flight and man's ecological-physiological requirements are discussed as related to the likelihood of mission success. Emphasis is placed on the specific problems encountered on a flight to Mars, considered as probably the only visitable planet. It is concluded that a manned landing mission to Mars, from a medical point of view, is feasible if the flight is based on a fast transfer trajectory. The experience gained in a lunar laboratory prior to undertaking such a flight will be of great benefit; establishment of such a station is also feasible within this century. A.C.R.

N69-36802# Academy of Sciences (USSR), Moscow.
PROBLEMS IN DETECTION OF EXTRATERRESTRIAL LIFE
A. A. Imshenetsky *In* School of Aerospace Med. Bioastronaut. and the Exploration of Space Nov. 1968 p 553–568 refs (See N69-36776 21-04)
Avail: CFSTI

A reliable method for detection of extraterrestrial life is presented, based on recording of growth and multiplication of heterotrophic microorganisms which might occur on planetary surfaces. Microbe existence is probable in two cases: (1) Various organic substances are accumulated on a planet as a result of chemical evolution (abiogenic synthesis); (2) Chemosynthetic or photosynthetic bacteria are present which synthesize organic compounds at the expense of atmospheric carbon dioxide. The latter assumption appears more probable. To test its validity, a modification of methods for detection of heterotrophic unicellular organisms is required. It is concluded that two possibilities may arise in searching for extraterrestrial life: (1) Active life may be absent, but, upon chemical and morphological examinations, remnants of former life may be found; the research program should therefore include paleobotanical and paleozoological studies. (2) Microorganisms, which are complex beings in an evolutionary sense, may not be found, but very primitive forms of life might be detected. There is no method at present, however, for conducting such an investigation. A.C.R.

N69-36842# Beckman Instruments, Inc., Fullerton, Calif. Advanced Technology Operations.
PARAMAGNETIC OXYGEN SENSOR STUDY Final Technical Report, 1 May 1967 – 1 Jun. 1968
Malbone W. Greene Wright-Patterson AFB, Ohio AMRL Jan. 1969 44 p
(Contract F33615-67-C-1632)
(AD-688260; FR-2488-101; AMRL-TR-68-123) Avail: CFSTI CSCL 6/11

A 4-month theoretical study of the Pauling Paramagnetic Oxygen Sensor was conducted. The results were condensed into a design criteria report that proposed a specific tentative desigr for a breadboard aerospace paramagnetic oxygen sensor. The selected approach utilized a capacitance bridge position sensing technique combined with electrostatic null-balancing to provide an electrical output that is a stable and linear function of the sample partial pressure of oxygen. Finally, the breadboard sensor was fabricated and tested for compliance to theoretical predictions and to specific design goals. The breadboard paramagnetic sensor fully meets the three basic contract requirements. Specifically, it uses the paramagnetic principle; it is applicable to manned space vehicle operation surviving typical launch and reentry environments. The mechanisms of the technique are well understood. In addition, the sensor meets or exceeds all specific design goals except its weight of 5.7 pounds (5 pounds desired) and an extraneous thermal coefficient due to mechanical distortion of critical parts with thermal variations that was observed in the first test unit. However, a flight unit can be reduced in weight to less than 5 pounds, and it has been demonstrated that standard mechanical design approaches will eliminate the extraneous thermal effects. Author (TAB)

N69-36845*# National Aeronautics and Space Administration, Washington, D.C.
INVESTIGATIONS INTO THE EFFECTS OF CARBONATED WATER CONTAINING SODIUM CHLORIDE UPON THE STRESSES AFFECTING THE BODY WHEN WORKING UNDER WARM CONDITIONS [CERCETARI REFERITOARE LA ACTIUNEA APEI CARBOGAZOASE CLORURO-SODICE ASUPRA SOLICITARII ORGANISMULUI IN MUNCA LA CALD]
Iancu Gontea et al Sep. 1969 22 p refs Transl. into ENGLISH from Probl. Terap. (Bucharest), v. 2, 1955 p 133–153
(NASA-TT-F-12321) Avail: CFSTI CSCL 06S

A comparative study of the effects upon the bodies of the same persons under identical work conditions and high temperatures (31–35 °C), where on one day the water regimen was tap water and on the other day was carbonated salted water containing 2.5 g NaCl per liter is reported. Author

N69-36925*# Dunlap and Associates, Inc., Darien, Conn.
DIFFERENTIAL THRESHOLDS FOR MOTIONS IN THE PERIPHERY
James M. Link and Leroy L. Vallerie Washington NASA Sep. 1969 22 p refs
(Contract NAS12-88)
(NASA-CR-1439; BSD-69-701) Avail: CFSTI CSCL 06N

A study was conducted to determine the differential thresholds for rotary and linear motion in the periphery. Isograms were developed based on threshold estimates obtained from ten subjects using the psychophysical method of limits. The results of this study indicated that differential thresholds for rotary and linear motion were found to increase as a linear function of eccentricity angle. Threshold isograms for both types of motion are elliptical in shape with the horizontal axis approximately twice as long as the vertical axis. Based on statistical analysis, there appears to be no real difference between rotary and linear motion. Subjects, however, reported a preference for rotary motion. Thresholds decreased logarithmically as a function of changing speed. Age of the subject appears to be a highly significant factor which influences the perception of motion. At high display velocities, subjects reported the occurrence of interference factors such as blur, fusion, strobing and flicker. These factors were particularly noticeable with the linear display. Author

N69-36970# Louisville Univ., Ky. Dept. of Opthalmology.
STUDY OF OCULAR EFFECTS OF CHRONIC EXPOSURE TO LASER RADIATION
Theodore Lawwill, Eugene P. Reese, Frank H. Sharp, and William E. Cox 1 Feb. 1969 28 p refs
(Contract DADA17-68-C-8105)
(AD-688181; Rept-1) Avail: CFSTI CSCL 6/5

Development of a model was initiated to compare retinal damage caused by chronic exposure to c.w. laser radiation and that caused by conventional illumination. The purpose of the comparison is to establish safety standards for c.w. lasers. The experimental animal used so far has been the rabbit. It was discovered that the rabbit eye is much more resistant to this kind of damage than animals previously tested. Author (TAB)

N69-36995*# Techtran Corp., Glen Burnie, Md.
A NEW CASE OF DIABETES INSIPIDUS WITH POLYDIPSIA. STUDY OF THIRST [UNE NOUVELLA OBSERVATION DE DIABETE INSIPIDE A PRECESSION POLYDIASIQUE. ETUDE DE LA SOIF]
M. Raoul, Simonne Kourilsky, Jacques Sicard, and Jean-Jacques Galey Washington NASA Sep. 1969 9 p refs Transl. into ENGLISH from Bull. Mem. Soc. Med. Hop. Paris, v. 58, 1942 p 115–121
(Contract NASw-1695)
Avail: CFSTI CSCL 06P

A considerable diabetes insipidus (181/day) developed in a 22-year-old girl, reacting perfectly to hypo-physial extract, plus an adeposo-genital syndrome and a weight gain of 26 kg in one after a cranial traumatism. The role of thirst is examined. Author

N69-37031*# National Aeronautics and Space Administration, Washington, D.C.
THE INFLUENCE OF GRAVITY ON THE DEVELOPMENT

AND THE MAINTENANCE OF BILATERAL SYMMETRY IN THE FROG EGG [UEBER DEN EINFLUSS DER SCHWERKRAFT AUF DIE ENTSTEHUNG UND ERHALTUNG DER BILATERALEN SYMMETRIE DES FROSCHEIES]
M. Moszkowski Sep. 1969 40 p refs Transl. into ENGLISH from Arch. Microskopische Anat. und Entwicklungsgeschichte (Freiburg), v. 60, 1902 p 17-65
(NASA-TT-F-12514) Avail: CFSTI CSCL 06C

Two extreme views regarding the influence of gravity on the organic formation of the developing egg are critically reviewed. The first view holds that gravity affecting the egg in the direction of its axis is absolutely required for the development of normal embryos. The second view holds the development of the egg to be the product of the most autonomous autodifferentiation and denies that the force of gravity as well as any other external force exerts a formative influence on the development of the frog egg. Based on the review of applicable literature and on experimental evidence obtained in the course of this study, it is shown that gravity has a direct, regulative effect on the development of the symmetrical structure of bilaterally symmetrical organisms and possibly also on the development of radially symmetrical organisms. K.W.

N69-37062*# Princeton Univ., N.J.
SECOND-ORDER WAVE STRUCTURE IN SUPERSONIC FLOWS
David A. Caughey Washington NASA Sep. 1969 87 p refs
(Grant NGR-31-001-119)
(NASA-CR-1438) Avail: CFSTI CSCL 20D

Second-order effects upon the wave systems associated with bodies in uniform supersonic flight are considered. An appropriate scaling of the independent variables is introduced to take into account the locally small, but cumulative, nonlinearities which determine the validity of the classical perturbation theories at large distances from the body. Predicted shock angles for the flow over slender wedges (planar flow) and cones (Axisymmetric flow) are compared with exact inviscid calculations to show the improvement afforded by inclusion of second-order effects. Inclusion of the full second-order solution is required to achieve appreciable improvement over the first-order theory for the conical case. Author

N69-37235# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Speech Communication.
SPEECH TRANSMISSION LABORATORY Quarterly Progress and Status Report, Jan.-Mar. 1969
15 Apr. 1969 101 p refs
(Grants NIH NB-04003-07; NIH HD-02111-04)
(STL-QPSR-1) Avail: CFSTI

CONTENTS:

1. THE STL COMPUTER INSTALLATION J. Liljencrants p 1-6 refs (See N69-37236 22-08)
2. SPECTRUM ANALYSIS USING THE FAST FOURIER TRANSFORM (FFT) J. Liljencrants p 7-13 refs (See N69-37237 22-08)
3. A QUANTITATIVE MODEL OF VOWEL PRODUCTION AND THE DISTINCTIVE FEATURES OF SWEDISH VOWELS B. Lindblom and J. Sundberg p 14-32 refs (See N69-37238 22-04)
4. ARTICULATORY DIFFERENCES BETWEEN SPOKEN AND SUNG VOWELS IN SINGERS J. Sundberg p 33-46 refs (See N69-37239 22-04)
5. THE DEPENDENCE OF VIBROTACTILE THRESHOLD AND MAGNITUDE FUNCTIONS ON STIMULATION FREQUENCY AND SIGNAL LEVEL: A PERCEPTUAL AND NEURAL COMPARISON O. Franzen (Stockholm Univ.) p 47-58 refs (See N69-37240 22-04)

N69-37238# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Speech Communications.
A QUANTITATIVE MODEL OF VOWEL PRODUCTION AND THE DISTINCTIVE FEATURES OF SWEDISH VOWELS
B. Lindblom and J. Sundberg *In its* Speech Transmission Lab. 15 Apr. 1969 p 14-32 refs (See N69-37235 22-04)
Avail: CFSTI

A physiological model of the speech organs is described which can be used to generate an acoustic waveform appropriate to vowel sounds. This model ressembles an artificial mouth with a tongue, jaw, larynx, and lips. The possible articulatory and acoustic capabilities of the model are also reported. Specific investigations were made on the proper use of the device to produce Swedish vowels and to answer questions concerning the phonetic dimension of the language's vowel system. Finally, the problem of relating the phonetic dimensions to the abstract phonological properties attributed to Swedish vowel segments is briefly treated, in an attempt to account for their systematic behavior in the phonological pattern of the language. Author

N69-37239# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Speech Communications.
ARTICULATORY DIFFERENCES BETWEEN SPOKEN AND SUNG VOWELS IN SINGERS
J. Sundberg *In its* Speech Transmission Lab. 15 Apr. 1969 p 33-46 refs (See N69-37235 22-04)
Avail: CFSTI

Articulatory differences previously observed in the formant frequencies of vowels were investigated. Articulatory positions in spoken and sung vowels were analyzed by means of X-rays and lip photography. The acoustical implications of these differences were determined by means of an electrical-line-analog simulation technique. Author

N69-37240# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Speech Communications.
THE DEPENDENCE OF VIBROTACTILE THRESHOLD AND MAGNITUDE FUNCTIONS ON STIMULATION FREQUENCY AND SIGNAL LEVEL: A PERCEPTUAL AND NEURAL COMPARISON
O. Franzen (Stockholm Univ.) *In its* Speech Transmission Lab. 15 Apr. 1969 p 47-58 refs (See N69-37235 22-04)
Avail: CFSTI

In order to obtain further knowledge concerning the neural mechanisms underlying sensory experience, an investigation was conducted to quantitatively characterize the relation between signal intensity and apparent intensity for various stimulation frequencies. Power transformation was of primary interest, and attempts were made to correlate the results with findings made in single-unit peripheral and central neurophysiology in the monkey and cat. The subjective detection threshold, as a function of stimulation frequency, is compared with the neural displacement-frequency curve for sinewave stimuli applied to the monkey foot. A dual mechanism of mechanoreception is discussed. A.C.R.

N69-37258# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
JUDGING THE POSITION OF A MOVING POINT AT THE MOMENT OF A SIGNAL [HET BEODELEN VAN EEN POSITIE VAN EEN BEWEGEND PUNT OP HET MOMENT VAN SIGNALERING]
J. Zwart and A. F. Sanders [1969] 14 p In DUTCH; ENGLISH summary
(IZF-1969-5; TDCK-52976-2) Avail: CFSTI

Seven subjects judged the position of a rapidly moving point at the moment of a signal. Three variables were used: the actual position of the point at the moment of signaling, the speed of the point, and the character of the signal. The signaling method was either a tone, a light flash, or a reduced brightness contrast between point and background. It appears that the trajectory can be sufficiently estimated. The position of the point on the trajectory at the moment of signaling is more difficult to judge. The degree of the error depends on all three variables. As to method of signaling, the reduced brightness contrast delivered best performance. Author

N69-37266# RAND Corp., Santa Monica, Calif.
SOVIET CYBERNETICS: RECENT NEWS ITEMS, VOLUME 3, NO. 4
Dorothy Mc Donald, ed. and Wade B. Holland, ed. Apr. 1969 147 p refs
(Contract F44620-67-C-0045; Proj. Rand)
(AD-688820; RM-6000/4-PR) Avail: CFSTI CSCL 6/4

Contents: BESM-6: focus on software; Soviet research in game theory applications; Large-scale automation of industrial planning, management, and control; Selected Soviet cyberneticists; Awards to scientists and scientific organizations; The concept of optimal mathematical planning; Properties and applications of glasslike semiconductors; When are computers profitable; The central economic-mathematics institute; Lithuanian research on mathematical cardiology; The All-Union School for mathematical programming; and The role of patent information. TAB

N69-37270# George Washington Univ., Alexandria, Va. Human Resources Research Office.
THE EFFECTS OF SLEEP DEPRIVATION ON PERFORMANCE OVER A 48-HOUR PERIOD
Eugene H. Drucker, L. Dennis Cannon, and J. Roger Ware May 1969 36 p refs
(Contract DAHC19-69-C-0018)
(AD-688950; HUMRRO-TR-69-8) Avail: CFSTI CSCL 5/10

An experiment was conducted to determine, for extended periods of work, the effects of (a) working for 48 hours without sleep on the efficiency of the work done, (b) starting work periods at night compared with starting in the morning, and (c) rotating jobs. Two-man teams performed a driving task and a target detection task; a control group performed the same tasks, but with provisions for sleep. Results indicate that performance deteriorates over a 48-hour period of work without sleep, and that deterioration occurs primarily at night, or during the subjects' normal sleeping hours. Job rotation to introduce another activity did not prevent performance decrements. Author (TAB)

N69-37280# Royal Aircraft Establishment, Farnborough (England).
THE BEHAVIOUR OF THE NYSTAGMIC RESPONSE TO THERMAL STIMULATIONS AS A FUNCTION OF REPETITION OF THE STIMULUS AT SHORT TIME INTERVALS [IL COMPORTAMENTO DELLA RISPOSTA NISTAGMICA DA STIMOLAZIONE TERMICA IN FUNZIONE DELLA RIPETIZIONE DELLO STIMOLO A BREVI INTERVALLI DI TEMPO]
V. Cenacchi et al May 1969 13 p refs Transl. into ENGLISH from Boll. Soc. Ital. Biol. Sper. (Italy), v. 41, 1965 p 531–535
(RAE-LIB-TRANS-1350) Avail: CFSTI

Described is the effect of repeated monoaural caloric irrigation in a group of 20 normal subjects. Each subject received a series of 10 irrigations with water at 30°C at intervals of 15 minutes, and nystagmus was recorded using an electro-oculographic technique. The nystagmic response showed a progressive attenuation with repetition of the test. Author

N69-37306# Systems Research Labs., Inc., San Antonio, Tex.
PHYSIOLOGIC MECHANISMS PRODUCING DISORIENTATION Final Report, Jun. 1967 – Feb. 1968
John Fletcher Brooks AFB, Tex. AF School of Aerospace Med. Dec. 1968 34 p refs
(Contract AF 41(609)-2897)
(AD-689161; SAM-TR-68-132) Avail: CFSTI CSCL 6/19

Disorientation is a complex phenomenon involving changed perception of posture, direction, distance, spatial arrangements, or time. A short review is given of current knowledge about the occurrence of spatial disorientation in man and its relationship to performance. Consideration is given to certain unexplained changes in sensation produced during motion, including travel in space vehicles, aircraft, ground vehicles, and movements which occur in the course of everyday life. Author (TAB)

N69-37311# George Washington Univ., Alexandria, Va. Human Resources Research Office.
MEASURES OF REACTION TO THREAT OF PHYSICAL HARM AS PREDICTORS OF PERFORMANCE IN MILITARY AVIATION TRAINING
Wiley R. Boyles May 1969 20 p refs Presented at the Southeastern Psychological Asso. Ann. Meeting, New Orleans, Feb. 1969 *Its* Exploratory Study No. 70
(Contract DAHC19-69-C-0018)
(AD-688817; HUMRRO-PP-15-69) Avail: CFSTI CSCL 5/10

Data from subjective reports, objective performance measures, and physiological studies indicate that flight training per se places a great deal of stress on the trainee. In military flight training additional stresses are involved that may markedly increase the importance of reaction to threat of physical harm. The paper reports effort to develop measures of reaction to physical harm threat and measures of change in confidence in ability to cope with that threat for use in the secondary selection process in U.S. Army aviation. Author (TAB)

N69-37315# Cornell Univ., Ithaca, N.Y.
COGNITIVE SYSTEMS RESEARCH PROGRAM. COLLECTED TECHNICAL PAPERS, VOLUME 3
F. Rosenblatt, ed. 30 Jun. 1968 143 p refs
(Contract Nonr-401(40); Grant NSF GK-2792)
(AD-677639; Rept-12) Avail: CFSTI CSCL 6/4

CONTENTS:

1. ON THE SHARPENING MECHANISM OF THE HEARING SYSTEM A. Molchanov and C. Tappert p 1–8 refs (See N69-37316 22-04)
2. A HEURISTIC MODEL OF THE HUMAN VISUAL PERCEPTION SYSTEM S. J. King p 9–31 refs (See N69-37317 22-04)
3. SOME EXPERIMENTS ON TOBERMORY MEMORY PERFORMANCE S. J. King p 33–45 (See N69-37318 22-08)
4. SOME INVESTIGATIONS OF C-SYSTEMS AND RELATED NETWORKS D. A. Petty p 47–62 refs (See N69-37319 22-08)
5. A REINFORCEMENT RULE FOR A MAJORITY DECISION NETWORK C. Kesler p 63–65 ref (See N69-37320 22-08)
6. A LINEAR REGION LOGIC UNIT C. Kesler p 67–78 refs (See N69-37321 22-08)
7. ACTIVITY REGULATION IN PERCEPTRONS N. M. Branston p 79–138 refs (See N69-37322 22-04)

N69-37316# Cornell Univ., Ithaca, N.Y.
ON THE SHARPENING MECHANISM OF THE HEARING SYSTEM
A. Molchanov and C. Tappert *In its* Cognitive Systems Res.

Program. Collected Tech. Papers, vol. 3 30 Jun. 1968 p 1-8 refs (See N69-37315 20-05)
Avail: CFSTI

The present paper describes a series of experiments on a peak detecting neural sharpening mechanism based on the hypothesis of double-differentiation in the place domain to improve a given system's ability in separating two sinusoidal signals of different frequencies. This sharpening mechanism makes use of neural inhibitory interaction similar to that found in the eye of the Limulus. To evaluate the possible improvement in performance of a given system in separating the two sinusoidal signals a comparison was made between the ratio of the amplitudes of the two signals at the input and the output of the system. The ratio at the input of the system can be calculated quite easily. However, the ratio at the output of the system, that is the relative increase in the output voltage due to the application of the second signal, can be quite difficult to estimate depending on the type of envelope detection employed. It is also evident that the performance of the system depends greatly on the property of the signal which excites the nerve endings. Author

N69-37317# Cornell Univ., Ithaca, N.Y.
A HEURISTIC MODEL OF THE HUMAN VISUAL PERCEPTION SYSTEM
Stephen Jon King *In its* Cognitive Systems Res. Program. Collected Tech. Papers, vol. 3 30 Jun. 1968 p 9-31 refs (See N69-37315 22-05)
Avail: CFSTI

The human visual processor or perception system is described in five black boxes with an interconnection scheme in a heuristic model based on available psychological and physiological data. The blocks are the preprocessor (which includes the eye), the figure and ground organizer, the recognizer, the encyclopedia, and the executive. The model applies to monocular perception of still, black and white photographs; by these restrictions the model considers accomplished pattern recognition of a scene by basic perceptual analysis. Scene analysis of a photograph and a print of a fresco is demonstrated by the use of a flow chart. Optimum use of the research results of other workers in the field of artificial intelligence is made. M.H.E.

N69-37322# Cornell Univ., Ithaca, N.Y.
ACTIVITY REGULATION IN PERCEPTRONS
Neil Mark Branston *In its* Cognitive Systems Res. Program. Collected Tech. Papers, vol. 3 30 Jun. 1968 p 79-138 refs (See N69-37315 22-05)
Avail: CFSTI

In the following work the problem of the regulation of activity level in the model for brain function known as the "perceptron" is surveyed. Section 2 is given over to an introductory review of the perceptron and current philosophies of brain modeling. In Section 3 requirements and models of activity regulation devices are discussed, and in the next two Sections details are given of the mathematical analysis and computer simulation experiments carried out in order to investigate, demonstrate and compare the regulating and stabilizing effects of certain of these models as auxiliaries to selected perceptrons. Finally in Section 6 the results obtained and some suggestions regarding future work in this direction are discussed. Author

N69-37354*# AiResearch Mfg. Co., Los Angeles, Calif.
SUPPORTING DEVELOPMENT FOR THE PRELIMINARY DESIGN OF AN INTERMEDIATE WATER RECOVERY SYSTEM
J. P. Byrne and A. Anderson, ed. 26 Aug. 1969 55 p
(Contract NAS9-8460)
(NASA-CR-101910; Doc-69-5470) Avail: CFSTI CSCL 05E

The supporting development effort was planned to include the identification of system and component areas which required particular concentration of development activity. Prototype models of critical components of the system - the compressor, phase separator, heat exchanger, and controls were fabricated and tested The components were than assembled into a system breadboard which was operated to establish system functional performance, operational characteristics, and the quality of product water. The basic objective of the supporting development effort was to assure system functionality and to demonstrate the developmental status and overall system operational characteristics. These objectives were met, although the results of some efforts, particularly component development, indicate that more development effort is required before a flight prototype system can be fabricated. The developmental status of the system is briefly summarized Author

N69-37374# Joint Publications Research Service, Washington, D.C.
LIFE SUPPORT SYSTEMS IN HIGH-ALTITUDE AND SPACE FLIGHTS
D. I. Ivanov et al 19 Sep. 1969 137 p Transl. into ENGLISH from the book "Sistemy Zhizneobespechiniya Cheloveka pri Vysotnykh i Kosmicheskikh Poletakh" Moscow, Machine Building Publishing House, 1968
(JPRS-48858) Avail: CFSTI

A broad review of existing equipment and systems, mostly Soviet and American, is presented. Physiological and hygienic standards and requirements of life support systems in aircraft are discussed, covering such subjects as pressurized cabin atmospheres, ventilation, oxygen equipment, pressure suits, and effects of vibration and noise. Oxygen equipment for operation in pressurized aircraft cabins and measures in case of depressurization are discussed. The design and development of aviation and space pressure suits is outlined, and examples are given of material strength calculations, ventilation systems, regeneration processes, and pressure regulators. A description of spacecraft cabins, space suits, and life support packs in the Soviet and American space programs deals also with problems of heat exchange and cooling systems. K.W.

N69-37377# National Aerospace Lab., Tokyo (Japan).
DESIGN AND CONSTRUCTION OF VTOL FLIGHT SIMULATION SYSTEM
Kazuo Higuchi, Moriyuki Momona, Norika Miyoshi, Masanori Okabe, Rokuro Yamamoto et al 1968 54 p refs In JAPANESE; ENGLISH summary
(NAL-TR-169) Avail: CFSTI

The main system components are (1) an integrated information display using a CRT and TV system and various kinds of controllers involved in a fixed-base cockpit. (2) A TV camera with 6 degrees of freedom to provide a visual scene of the takeoff and landing approach below 120m ceiling. The model represents an area 2,600m by 1,000m at a 1:400 scale. The pilot may be presented with a projected or monitor image as a visual aid. The system is controlled through an analog computer programmed to account for vehicle dynamic response to pilot control input. Studies such as flight performance, human characteristics in information transfer, stability and controllability at low speed and transition flight of VTOL aircraft are carried out using this system. Author

N69-37390# Uppsala Univ. (Sweden). Inst. of Physics.
MUSCLE VIBRATORS CONTROLLED BY MYO-SIGNALS
A. Hedberg, B. Oldberg, and P.-A. Tove [1969] 14 p refs
(UUIP-641) Avail: CFSTI

In order to restore some voluntary motor control of paralyzed elbow muscles, a vibrator has been designed in which the

electromyographic activity directly controls the action of the vibrator. The project was designed primarily to assist in the investigations of the use of tonic vibration reflexes to increase the range of movement for patients with spastic paresis, but it only functions in certain cases. ESRO

N69-37425# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

INFLUENCE OF DIRECTION OF MOVEMENT AND PERIOD DURATION ON THRESHOLD SENSITIVITY FOR PERIODICAL HORIZONTAL MOVEMENT [DE INVLOED VAN BEWEGINGSRICHTING EN PERIODEDUUR OP DE DREMPELGEVOELIGHEID VOOR PERIODIEKE HORIZONTALE BEWEGING]

J. P. vanBraam Houckgeest [1969] 21 p refs In DUTCH; ENGLISH summary

(IZF-1969-9; TDCK-53363-2) Avail: CFSTI

The parallel-swing experiments here reported have yielded data on the influence of the swinging period T upon the threshold for horizontal linear acceleration, and on the magnitude of threshold sensitivity for three directions of movement in the horizontal plane. A new method of threshold determination in this kind of experiment was used. It was found that for a subject lying on his back the threshold in the interval T=2 to 5 sec increases linearly (but not proportionally) with T; further, that threshold is minimal for transverse movement. Also, an impression was obtained of the importance of the vestibular system relative to the other sensory systems involved in the perception of the movement. It was concluded that under the circumstances of the experiment otolith information was more important than stimulation of the other systems involved. In the case of unusual head positions, however, an extra effect seems to be present tending to increase threshold, the influence of which is of the same order of magnitude as that which emanates from the otolith organs. Furthermore, a critique is given of the usual methods of threshold measurement on the parallel swing; experience with two other methods, which proved unsuccessful, stresses the importance of some of the objections raised. Author

N69-37469# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

STANDARDIZATION OF THE DETERMINATION OF THE VISUAL ACUITY WITH OPTO-TYPE-CHARTS [STANDAARDISERING VAN DE GEZICHTSSCHERPTEBEPALING MET OPTOTYPENKAARTEN]

J. J. Vos [1969] 34 p refs In DUTCH; ENGLISH summary

(IZF-1969-11; TDCK-53816-2) Avail: CFSTI

The current practice of the determination of visual acuity is defectively standardized. This gives difficulties at medical examinations and with the transfer of clinical data. It is investigated why the numerous efforts for standardization have failed in the past. It seems that this is caused by a bad elaboration of the thoughts developed and by a complete absence of a follow-up to carry through the results obtained. Much care is bestowed upon concrete elaboration of the basic ideas of standardization and upon the policy required to get the standard introduced and accepted. Author

N69-37517*# Texas Technological Coll., Lubbock.

REMOVAL OF ACID GASES AND OXIDES OF NITROGEN FROM SPACECABIN ATMOSPHERES

A. J. Gully, R. M. Bethea, R. R. Graham, and M. C. Meador Washington NASA Jul. 1969 148 p

(Contract NAS1-7584)

(NASA-CR-1388) Avail: CFSTI CSCL 06K

The methods of removal of oxides of nitrogen and of the acid gases sulfur dioxide, hydrogen chloride, hydrogen fluoride, and chlorine in low concentrations from air as part of the effort to develop an effective atmospheric purification subsystem for long-term manned space missions were studied. Methods investigated were: (1) reaction with basic solid materials, (2) adsorption, and (3) for oxides of nitrogen, catalytic reduction of nontoxic to less toxic gases. Adsorption at ambient temperature of both chlorine and nitrogen dioxide on activated carbon was found to be rapid with sulfur dioxide being adsorbed to a lesser extent. In exploratory work, nickel oxide and copper oxide were found to exhibit appreciable activity in the catalytic decomposition of nitrogen dioxide. Maximum decomposition of nitrogen dioxide observed (nickel oxide catalyst at 482°C) was 53%. Nitric oxide was the major decomposition product. Solid-gas reaction was found to be the most generally effective method of contaminant removal. The solid reactants tested included sodium carbonate, sodium bicarbonate, barium carbonate, calcium carbonate, lithium carbonate, and manganese dioxide. Author

N69-37587*# Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.

STUDIES OF HUMAN DYNAMIC SPACE ORIENTATION USING TECHNIQUES OF CONTROL THEORY Status Report, Jul. 1968–Jun. 1969

L. R. Young and Y. T. Li Jun. 1969 56 p refs

(Grant NsG-22-009-025)

(NASA-CR-105925) Avail: CFSTI CSCL 06P

Research over a wide range of topics related to dynamic space orientation and instrumentation of interest to aviation medicine was conducted. Areas investigated are: (1) manual control modeling of the human operator in a pilot role, particularly in complex multi-loop adaptive systems; (2) display systems for current and future vehicles, emphasizing essential features which enable a pilot to sense his orientation with respect to earth and to other obstacles in the environment; (3) vestibular functions and responses to environment; (4) eye movement analysis and modeling; (5) cybernetic problems of manual control, human behavior, and man-machine systems; (5) neuromuscular and postural control; and (6) life support systems in unusual environments. Finally, possible applications of the research results to clinical medicine are discussed. These include use of hybrid computer displays for orthopedic surgeons, postural control diagnostics for neurology, diagnosis of diabetes mellitus from the system theory point of view; and use of new vestibular testing procedures to diagnose vestibular disorders. A.C.R.

N69-37757# Aerospace Medical Div. Aeromedical Research Lab. (6571ST), Holloman AFB, N.Mex.

A PRELIMINARY INVESTIGATION OF THE EFFECT OF REPEATED LOW DOSES OF MONOMETHYLHYDRAZINE ON OPERANT BEHAVIOR OF PRIMATES

Glayde D. Whitney, Henry L. Taylor, Duane R. Johnson, and Paul Y. Batson Mar. 1969 20 p refs

(AD-688253; ARL-TR-69-7) Avail: CFSTI CSCL 6/20

The rocket fuel monomethylhydrazine (MMH) is known to have severe disruptive effects on learned behavior. Behavioral toxicity, measured as decrement in instrumental performance, has been found following dosages of 2.5 mg/kg or more. This experiment was designed to explore effects on behavior of doses lower than those previously studied, and to investigate possible cumulative behavioral effects or repeated exposures to low concentrations of MMH. Monkeys performing a learned instrumental avoidance task requiring continual discrimination of cues were given repeated injections of MMH at four dose levels ranging from 0.5 mg/kg to 4.0 mg/kg. The results indicate that exposure to low doses may result in highly significant behavioral stimulation. Indications of a cumulative effect from repeated exposure on behavior are noted.

Cumulative effects and increases in rate of performance following exposure to these doses may indicate important behavioral toxicity of MMH at dose levels lower than those previously considered. Author (TAB)

N69-37759# Georgia Inst. of Tech., Atlanta. Electronics Div.
PRELIMINARY INVESTIGATION OF THE USE OF ELECTROMAGNETIC RADIATION IN DIFFERENTIAL HYPOTHERMIA
H. Allen Ecker, R. P. Zimmer, and R. W. Camp Jul. 1969 19 p refs
(TN-1) Avail: CFSTI

The objective was to investigate and to evaluate techniques and practicable equipment suitable for accomplishing differential hypothermia (tumor-body) with electromagnetic energy. In general, it is desirable to produce a temperature difference of about 33°C between the tumor and surrounding tissue with the temperature of the tumor being maintained at normal body temperature and the surrounding tissue at the cooler temperature. During the initial studies, it was assumed that the subject tumor would be located deep below the surface of the body and investigations were concerned with that type of tumor. However, the heating of large surface tumors was emphasized later because it was believed that there was an immediate need for equipment to heat such tumors and that equipment suitable for treating these tumors could be designed with less effort than that required for a deep tumor. A survey of literature was made to obtain information on the electrical and thermal properties of biological materials and to determine existing theoretical and experimental techniques in the general area of microwave heating; the bibliography and more relevant references are included. Author

N69-37793# Cornell Univ., Ithaca, N.Y. Center for Applied Mathematics.
FEATURE DETECTION NETWORKS IN PATTERN RECOGNITION Interim Scientific Report
Edward Martin Riseman Jun. 1969 139 p refs
(Grant AF-AFOSR-1402-68)
(AD-689429; AFOSR-69-1249TR) Avail: CFSTI CSCL 6/4

In some pattern recognition problems a large number of patterns may be decomposed into a small set of subpatterns which can reconstitute each of the patterns. The use of such features can result in an economical recognition network. In such cases the pattern set may have an inherent hierarchical structure which can be incorporated in a layered logical network. An algorithm is presented which uses a training set of patterns to determine this structure. The subpatterns, termed features, are generated sequentially through an adaptive process of weight alteration in a neural network as each pattern is iteratively presented. A measure of relatedness of a set of points is utilized to decide which subset of points associated with these sets of weights represents useful information and should be selected as a feature. Experimental results indicate the potential of the algorithm in organizing a recognition network to correspond to the information structure of the pattern set. Author (TAB)

N69-37842*# Indiana Univ., Bloomington. Dept. of Botany.
STUDY OF EFFECTS OF LUNAR MATERIALS ON BOTANICAL SYSTEMS (APOLLO 11) Final Report, 3 Feb.–30 Sep. 1969
Paul G. Mahlberg 30 Sep. 1969 19 p refs
(Contract NAS9-9211)
(NASA-CR-101912) Avail: CFSTI CSCL 06C

The Botanical Test Systems are analyzed for their normality following test conditions with lunar soil. Four categories of tissues were selected for histological examination and evaluation. These are: callus tissues, cotyledon segments, leaf disks, and root segments. Experimental procedures are described, and results tabulated. F.O.S.

N69-37878# Reactor Centrum Nederland, Petten.
THE DETERMINATION OF BROMINE IN WHEAT, FLOUR AND BREAD BY NEUTRON ACTIVATION ANALYSIS
H. A. Das Apr. 1969 13 p refs
(RCN-106) Avail: CFSTI

A routine method is presented for the determination of bromine in wheat and bread by thermal neutron activation analysis. The application to the determination of traces of bromine-containing germicides is discussed. Author (ESRO)

N69-37887*# National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY Continuing Bibliography with Indexes, Aug. 1969
Sep. 1969 79 p refs
(NASA-SP-7011(67)) Avail: CFSTI CSCL 06C

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N69-37888# Commissariat à l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucléaires.
A COMPARATIVE STUDY OF THE $^{90}Sr/Ca$ RATIO IN HUMAN DIET AND BONE TISSUE [ETUDE COMPAREE CHEZ L'HOMME DU RAPPORT $^{90}Sr/Ca$ DANS L'ALIMENTATION ET LE TISSU OSSEUX]
René Coulon and Claude Madelmont Jun. 1969 44 p refs In FRENCH; ENGLISH summary
(CEA-R-3848) Avail: CFSTI

A comparative study of both the evolution of the strontium-90 content in the bones of individuals of different ages for the period 1962–1967 as related to calcium, and also the corresponding diets gave a relationship between food contribution and the resulting bone burden. The study is mainly devoted to a group of adults for which a mathematical expression is proposed, which allows for the exchangeable form of a skeletal calcium fraction turned over in less than a year from the dietary calcium, and the stabilized form constituting the larger part of bone tissue characterized by a slow turnover. Both the amount of the exchangeable fraction and the turnover rate of the stabilized fraction are determined for vertebrae and ribs. At birth, bone levels indicate that the calcium used or skeleton modelling during foetal life originates from both maternal diet and bone tissue and a value is given for their relative significance. There is a good relationship between bone levels in infants from 6 months to 1 year of age and their diets and the physiological parameters particular to this age are quantified. Author (ESRO)

N69-37899# Tennessee Univ., Knoxville. Dept. of Psychology.
LONG-TERM EFFECTS OF RADIATION: MAMMALIAN BEHAVIOR Technical Progress Report, Feb. 1968–Feb. 1969
Ernest Furchtgott 28 Feb. 1969 12 p refs
(Contract AT(40-1)-3260)
(ORO-3260-4) Avail: CFSTI

This study proposes to measure longitudinally general activity in a small box with an ultrasonic device as well as in an open field and swimming speed in mice irradiated as young adults and who have passed the acute radiation syndrome. Both general activity and swimming speed decline with age. Thus, if radiation hastens and/or mimics normal aging, the irradiated mice should show the behavioral decrements sooner and/or to a greater extent than control animals. The behavioral measures will be correlated with general pathological indices. Author (NSA)

N69-37909*# National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY Continuing Bibliography with Indexes, Jul. 1969
Aug. 1969 172 p refs
(NASA-SP-7011(66)) Avail: CFSTI CSCL 06C

The contents of this ussue are comprised of abstracts relating to biological, physiological, psychological, and environmental effects to which man is exposed during and following simulated or actual flight in the earth's atmosphere or interplanetary space. Included are such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors. References describing similar effects on lower biological organisms are also considered. G.G.

N69-37917# California Univ., Livermore. Lawrence Radiation Lab. Bio-Medical Div.
RADIATION EFFECTS ON Poly-dAT FROM INTRAMOLECULAR TRITIUM
J. A. Mazrimas, F. T. Hatch, C. C. Bishop, and J. E. Gill 6 Dec. 1968 30 p refs Sponsored by AEC
(UCRL-50559) Avail: CFSTI

Poly-dAT (a polymer of alternating deoxyadenylic and deoxythymidylic residues) was biosynthesized from tritiated deoxythymidine-5′-triphosphate of high specific activity and deoxyadenosine-5′-triphosphate. Aqueous solutions were stored at −20°C and thawed at intevals for comparison of template activity, ultraviolet absorbance and thermal transition with that of unlabeled poly-dAT. The ^3H content of the two samples was 1.5×10^8 and 4.4×10^8 dpm/mg. Radiation doses were estimated to be 2.9 and 8.6 rad/day (300 and 1000 rad over 3 months), respectively, assuming uniform distribution of absorbed energy in the solution. The normally excellent template activity of poly-dAT for RNA and DNA polymerases from *Escherichia coli* progressively decreased. The impairment became measurable after a dose of only 20-50 rad. After three months there was a moderate increase in molar ultraviolet absorbance at 260 nm and a marked increase in the absorbance ratios at 230/260 and 290/260 nm. Author (NSA)

N69-37920# Army Foreign Science and Technology Center, Washington, D.C.
CERTAIN ASPECTS OF THE DESIGN OF MAN-MACHINE SYSTEMS
V. L. Veits et al May 1969 16 p refs Transl. into ENGLISH from Mashinostr (Kiev), 1968 p 3–9
(AD-689248; FSTC-HT-23-158-69) Avail: CFSTI CSCL 5/8

The report discusses problems of man-machine interface. The process between input and output is divided into three parts: perception of sensing; understanding or processing; and formulation of command or acting on control organs. Feed back is accomplished between the output (result) and the command formulation stage. On the basis of the parameters developed, models are produced to simulate the above parts of the process. Formulae are developed and applied to the solution of problems. Author (TAB)

N69-37951# Sandia Corp., Albuquerque, N. Mex.
GENERALIZED; SNAP SAFETY ANALYSIS MODELS
R. E. Smith and I. J. Hall Sep. 1968 37 p refs
(Contract AT(29-1)-789)
(SC-DR-68-345) Avail: CFSTI

This report presents a general mathematical approach for evaluating the risk of using radioactive materials in space missions. Two basic safety models, that encompass the general safety criteria philosophies concerning the number of people receiving a specified amount of radiation and the total radiation received by the population, are derived. Each model is applicable to presently conceived hazard situations that may arise from the use of radioactive materials. Author (NSA)

N69-37964*# AiResearch Mfg. Co., Los Angeles, Calif.
MAN'S CAPABILITY FOR SELF-LOCOMOTION ON THE MOON. VOLUME 1: DETAILED REPORT
E. C. Wortz, W. G. Robertson, L. E. Browne, and W. G. Sanborn Washington NASA Sep. 1969 408 p refs Revised
(Contract NAS1-7053)
(NASA-CR-1402; Rept-68-3986-Rev-1) Avail: CFSTI CSCL 06S

Results are presented on a comprehensive study of man's self-locomotive capabilities in simulated lunar gravity. An inclined-plane and a gimbal-vertical simulator equipped with treadmills were used to simulate lunar gravity. Man's locomotive characteristics and the metabolic costs of walking, running, and loping at velocities from 2 to 12.8 km/hr were determined for subjects in pressurized Gemini-4C suits. The results showed that the energy cost of locomotion in simulated lunar gravity is considerably less than that in earth gravity. Ascending grades caused large increases in metabolic cost over that of level walking where the magnitude of the cost depends on the simulation technique used. Increasing the load carried from 75 to 400 earth-pounds had a small and inconsistent effect on metabolic costs. Changing the smooth, hard walking surface to sandy soil caused a large increase in the metabolic cost at the higher locomotion rates. Author

N69-37975*# Webb Associates, Yellow Springs, Ohio.
AUTOMATIC CONTROL OF WATER COOLED SUITS FROM DIFFERENTIAL TEMPERATURE MEASUREMENTS Final Report
Samuel J. Troutman, Jr. and Paul Webb Aug. 1969 36 p refs
(Contract NAS12-682)
(NASA-CR-86244) Avail: CFSTI CSCL 06K

An automatic controller based on temperature changes (ΔT controller) was designed for the clothing assembly of a man doing treadmill work. Inputs to the ΔT controller were: (1) the difference between suit inlet and outlet water temperature (heat removal rate at fixed water flow); and (2) four selected skin temperatures. Experiments established the correct weighting and damping factors for smooth and accurate control. Further experiments evaluated the ΔT controller during quiet periods, moderate steady work, and intermittent work. Long-term accuracy and stability were established during a final experiment lasting 16 hours, in which the subject slept, ate, worked, and rested. The advantages of the ΔT controller are that it provides relief from the responsibility for regulating one's own thermal state; guarantees low sweat rates and no dehydration at the same time as it prevents chilling and discomfort; provides maximum heat removal and minimum heat storage; and gives good long-term stability at low metabolic levels. Author

N69-37999# Atomic Energy Commission Research Establishment, Risö (Denmark). Chemistry Dept.
PREPARATION OF I^{131}-LABELLED PROTEINS BY AN ELECTROLYTICAL METHOD AND PURIFICATION OF THE LABELLED PRODUCT

Zhila Khalkhali (Tehran Univ. Nucl. Center), and Ulf Jacobsen Dec. 1968 31 p refs
(RISO-192) Avail: CFSTI

The aim of this work was to establish a simple and reliable method for iodine labelling of different proteins and purification of the labelled products to the extent where they can be used for metabolic investigations. The preparation of iodine labelled, high specific activity proteins through an electrolytical method is reported. Human serum albumin was selected as a model substance for preliminary experiments to find the optimum condition for labelling. Different proteins were iodinated to a mean level of 0.1-0.5 atom per molecule of protein, a labelling yield of ≅90% was achieved in most cases. Investigations were also made covering the purification of the labelled product immediately after the preparation by gel filtration. Metabolic studies and pyrogenity tests carried out on the labelled and purified rabbit serum albumin and transferrin demonstrated that the product is pyrogene free and metabolized as the genuine proteins. Author (ESRO)

N69-38002# Commissariat à l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucléaires.
INTERNAL DECONTAMINATION OF A RADIOACTIVE ZIRCONIUM-NIOBIUM OXALATE IN RATS DECONTAMINATION INTERNE CHEZ LE RAT D'UN OXALATE DE ZIRCONIUM-NIOBIUM RADIOACTIF]
Renaud Rinaldi, Michel Gavend, and Jean-Pierre Rinaldi May 1969 15 p refs In FRENCH; ENGLISH summary
(CEA-R-3810) Avail: CFSTI

A study of the internal decontamination of rats with ^{95}Zn-^{95}Nb oxalate injected by intravenous and intratracheal routes confirmed the effectiveness of zirconium citrate studied in previous work. In the treated animals, an increased urinary excretion and a clear decrease of the accumulation of radio-isotopes in bones was noted. However, the effectiveness of the zirconium citrate depends on the rapidity of intervention. Author (ESRO)

N69-38008# Atomic Energy Commission Research Establishment, Risö (Denmark). Electronics Dept.
KIDNEY CONSTANT CALCULATOR
K. Soe Hojberg and E. Knudsen (Finsen Lab.) Apr. 1969 13 p refs
(RISO-M-878) Avail: CFSTI

The program is used for the determination of two constants describing the transport of hippuran to and from the kidneys on the basis of a simple kidney and external system model. The data used for the computation are derived from a renogram test. Author (ESRO)

N69-38119# Edgerton, Germeshausen and Grier, Inc., Los Angeles, Calif.
HELIUM NEON LASER EFFECTS ON THE EYE Annual Report, 1 Aug. 1968–31 Mar. 1969
Thomas P. Davis and William J. Mautner Apr. 1969 64 p refs
(Contract DADA17-69-C-9013)
(AD-689483; EG-G-C106-59223) Avail: CFSTI CSCL 6/5

The objective of this program was an investigation of the effects of helium-neon laser radiation on the eye. All exposures were of 10 second duration, and the ophthalmoscopically visible retinal lesion was selected as the injury criterion. Median effective powers were established for retinal exposure spot diameters of 100, 260, and 800 micrometers. Injury was assessed immediately, and at 10 minutes, 1 hour, and 1 day post-exposure. An analytical prediction of the relationship between median effective power and spot size was also tested. The sensitivity ratio was not constant, but depended on spot size. Median effective powers increased with increasing spot size, as expected, but the increase was not as great as that predicted analytically. It was concluded that a thorough study of the analytical prediction of injury is needed to resolve this discrepancy. The need for a damage criterion based on functional injury was also recognized. Author (TAB)

N69-38132# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPACE CARDIOLOGY
V. V. Parin et al Feb. 1969 258 p refs Transl. into ENGLISH of the publ. "Kosmicheskaya Kardiologiya" Leningrad, Izd. Meditsina, 1967 p 1–206
(AD-689027; FTD-MT-24-337-68) Avail: CFSTI CSCL 6/5

The present work deals with the problems of space medicine and contains some material relevant to the preservation of human health during space flight. An attempt is made to bring to a system the results of experimental investigations obtained during space flight. Detailed cardiological methods of space research including those based on mathematical and statistical data are stated. Some material obtained in the clinic with the help of space cardiology and the resultant data of clinicophysiological analysis taken in space flight are also presented. Cardiological theories are considered in connection with all the human reactions to space flight factors. Author (TAB)

N69-38165# School of Aerospace Medicine, Brooks AFB, Tex. Pharmacology-Biochemistry Branch.
THE EFFECT OF MONOAMINE OXIDASE AND DIAMINE OXIDASE INHIBITORS ON NOREPINEPHRINE AND HISTAMINE IN RAT HEART Technical Report, Sep. 1967–Sep. 1968
David H. Ross and Miguel A. Medina Apr. 1969 12 p refs
(AD-689163; SAM-TR-69-19) Avail: CFSTI CSCL 6/15

The effect of several hydrazine and nonhydrazine compounds on the concentrations of norepinephrine and histamine in the rat heart was studied. The compounds used were either monoamine oxidase (MAO) or diamine oxidase (DAO) inhibitors. Hydrazine (0.31 mmole/kg.), monomethylhydrazine (0.31 mmole/kg.), pargyline (0.16 mmole/kg.), and tranylcypromine (0.16 mmole/kg.) produced significant elevations of norepinephrine in the heart. The increase produced by monomethylhydrazine (MMH), pargyline, and tranylcypromine may be due to the fact that they are potent MAO inhibitors, but this does not explain the effect of hydrazine which is devoid of any MAO inhibitory action. Histamine levels in the heart were elevated only by MMH (0.31 mmole/kg.) and pargyline (0.16 mmole/kg.). MMH inhibited DAO, but pargyline does not have any effect on this enzyme. The mechanism whereby hydrazine increased norepinephrine in heart and pargyline elevated histamine does not appear to be dependent on their ability to inhibit the enzymes connected with the metabolism of these two amines. These experiments indicate that the extent of MAO or DAO inhibition by a specific compound is not related to its ability to affect tissue amine levels. The data also show that exposure to MMH or hydrazine could affect the cardiovascular system by changing the levels of amines in the heart. Author (TAB)

N69-38166# Naval Aerospace Medical Inst., Pensacola, Fla. Army Aeromedical Research Unit, Fort Rucker, Ala.
AUTOMATIC RESPONSES TO VESTIBULAR STIMULATION
Pei Chin Tang and Bo E. Gernandt Apr. 1969 29 p refs Prepared jointly by Army and Navy
(AD-689118; USAARL-69-8; NAMI-1066) Avail: CFSTI CSCL 6/16

Decerebrate, paralyzed cats were used to determine some autonomic effects of vestibular stimulation and to establish through

which peripheral links this vestibulofugal activity was transmitted. Vestibular stimulation increased both rate and depth of respiration, as demonstrated by phrenic and recurrent laryngeal nerve recording, and a marked elevation in blood pressure accompanied this effect. When the strength of stimulation was reduced and the evoked respiratory effect weak or questionable, the systemic blood pressure declined. Vestibular stimulation elicited strong responses from the neck vagus nerve, but this vestibulo-vagal activity was found to be conducted exclusively in the recurrent laryngeal nerve and not in the vagus nerve proper. Only the sympathetic portion of the autonomic system responded to vestibular stimulation, thus providing vestibular impulses a channel for reaching different effector organs. The responses obtained from the neck sympathetic nerve were analyzed and their characteristics described. Author (TAB)

N69-38195# American Type Culture Collection, Rockville, Md.
A STUDY OF THE EFFECTS OF STORAGE TEMPERATURE AND THAWING METHODS ON THE LONG-TERM PRESERVATION OF SELECTED STRAINS OF MICROORGANISMS AND MAMMALIAN CELLS Final Report
John E. Shannon May 1969 72 p refs
(Contract DA-49-092-ARO-26)
(AD-689499) Avail: CFSTI CSCL 6/5

The objective of this study was to determine the effects of temperature of storage and thawing on the viability of microorganisms and mammalian cells frozen for long periods. Test strains were: Syzygites megalocarpus, ATCC 11807, Penicillium megasporum, ATCC 12322, Vibrio cholerae, ATCC 12174, Staphylococcus aureus, ATCC 6538, and derivatives of strain L mouse connective tissue cells, NCTC clone 929, ATCC-CCL 1, and human skin epithelial cells, NCTC 2544, ATCC-CCL-19. Quantitative tests for viability were made prior to freezing, within 24 hours after freezing, at the end of three months, at the end of one year, and at yearly intervals for five years. Thawing was carried out directly from temperature levels higher, lower, or the same as the temperature of storage. For fungi and animal cell lines, storage at -196C was vastly superior to storage at -20C and -79C. For bacteria, storage was almost as effective at -79C as at -196C; -20C storage was less effective. Experiments at both 3-month and 12-month storage periods indicated that there is no advantage to thawing the cells from temperatures lower (or higher) than the temperature of storage. The results indicate that when cells are frozen under similar controlled conditions the storage temperature level per se is the most critical factor in long-term preservation provided the cells are thawed rapidly. Author (TAB)

N69-38199*# National Aeronautics and Space Administration, Washington, D.C.
THE PHYSIOLOGY OF HUMAN DIABETES INSIPIDUS MUST BE INTERPRETED MUCH MORE IN RELATION TO THIRST THAN TO POLYURIA [LA PHYSIOLOGIE DU DIABETE INSIPIDE HUMAIN DOIT-ETRE CONCUE EN FONCTION DE LA SOIF BEAUCOUP PLUS QUE LA POLYURIE]
R. Kourilsky et al Sep. 1969 7 p refs Transl. into ENGLISH from Soc. Med. des Hopitaux de Paris Bull. et Mem. (France), v. 58, 1942 p 104 - 109
(NASA-TT-F-12512) Avail: CFSTI CSCL 06P

A detailed analysis is discussed concerning the behavior of a case of syphilitic diabetes insipidus. Thirst was the primary clinical phenomenon, and polyuria was secondary in diabetic patients studied. The results are combined and studied in order to find a clue to the pathogenesis. J.A.M.

N69-38221*# Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.
PROBLEM CONCERNING REACTION OF THE ORGANISM UNDER EXTREMAL CONDITIONS [K VOPROSU REAKTIVNOSTI ORGANIZMA PRI EKSTREMALNYKH VOZDEYSTVIYAKH]
V. V. Antipov et al Washington NASA Mar. 1969 10 p refs Transl. into ENGLISH from Russian Paper Presented at 3d Intern. Symp. on the Basic Environ. Probl. of Man in Space, Geneva, 15 19 May 1968
(Contract NASw-1692)
(NASA-TT-F-12098) Avail: CFSTI CSCL 06S

The authors examined the effect of vibrations, G-forces and weightlessness on the reaction of the organisms of mice and guinea-pigs, as well as the positive and negative effects of certain chemico-medical remedies. Their experimental data showed that the effects of the combined action of ionizing radiation and space flight factors, particularly vibrations and accelerations, are complex and numerous, and that, in many cases, the preliminary action of the dynamic factors decreases the radiation effects. It is seen that radiation illness can be worsened during repeated actions of vibrations and accelerations. Author

N69-38226*# Techtran Corp., Glen Burnie, Md.
THE PERIODIC MOVEMENTS OF LEAF ORGANS
W. Pfeffer Washington NASA Sep. 1969 139 p refs Transl. into ENGLISH of the book "Die Periodischen Bewegungen der Blattorgane" Leipzig, Wilhelm Engleman Press, 1875 p 1 - 180
(Contract NASw-1695)
(NASA-TT-F-12414) Avail: CFSTI CSCL 06C

The movement of leaf organs, whether caused by assymetrical growth, changes in lighting, temperature variations, or internal factors, are analyzed. Light is found to be principally a toning factor in daily movement, the rate of expansion of a leaf part being inversely proportional to illumination level. Geotropic and heliotropic movements without growth are discussed. Author

N69-38235*# National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY A Continuing Bibliography with Indexes, Apr. 1969
May 1969 198 p refs
(NASA-SP-7011(63)) Avail: CFSTI CSCL 06C

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N69-38237# School of Aerospace Medicine, Brooks AFB, Tex.
RADIATION MORTALITY OF RODENTS UNDER HYPOBARIC-HYPOXIC CONDITIONS Final Report, Jun. - Oct. 1968
George S. Melville, Jr., Emmett J. Stork, Arthur E. Gass, Jr., Perry D. Rusk, Jimmy Rasmon et al Apr. 1969 21 p refs
(AD-690130; SAM-TR-69-18) Avail: CFSTI CSCL 6/18

The purpose of this study was to establish whether reduced oxygen concentration (hypoxia) and reduced atmospheric pressure (hypobarism) significantly change the radiosensitivity of rodents. Approximately 1,800 male Swiss-Webster mice, committed in groups of 50, and 56 male Sprague-Dawley rats were gamma-irradiated at low dose rates in an altitude chamber. Experimental groups of hypoxic and hypobaric mice received total doses of 900 to 2,100 R cobalt-60 gamma rays. Survival in all experimental groups was negligible; in one instance less than that of corresponding controls. In

most experimental groups, however, the hypoxic-hypobaric groups achieved a longer mean survival time than did corresponding controls. At 1,300 R, the control group achieved a mean survival time of 7.3 days. Three groups similarly irradiated but hypoxic and hypobaric at 22,500 ft. recorded mean survival times of 9.7 days, 9.9 days, and 9.7 days, respectively. Additionally, three groups similarly irradiated but hypoxic and hypobaric at 15,000 ft. achieved mean survival times of 10.2 days, 12.7 days, and 12.4 days, respectively. The LD50/30 for normal mice irradiated as controls in the apparatus at ambient pressure and oxygen concentration was calculated to be 850 plus or minus 72 R. By assuming the validity of the hypothesis that hypoxia is radioprotective, simultaneous hypobarism appears to nullify, at least partially, this radioprotective effect. Author (TAB)

N69-38240# School of Aerospace Medicine, Brooks AFB, Tex.
A MODIFIED Fe 59 FERROKINETIC PROCEDURE Final Report, Nov. – Dec. 1968
Donald F. Logsdon, Jr., James F. Green, and John W. Harper Apr. 1969 11 p refs
(AD-690129; SAM-TR-69-24) Avail: CFSTI CSCL 6/18

In an effort to reduce the exposure dose from the 59Fe ferrokinetic procedure, the injection dose was reduced from 6 microcurie to 0.6 microcurie. Although the count rate was reduced, counts above background were obtained. The blood volume, plasma iron clearance, and red cell iron uptake were measured and found to be within normal limits. Measurement of 59Fe in the spleen, heart, liver, and sacrum by external counting produced curves closely similar to those found with the higher dose. The total-body exposure dose was reduced from 110 mrem to 11 mrem. Author (TAB)

N69-38242*# National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY A Continuing Bibliography with Indexes, May 1969
Jun. 1969 166 p refs
(NASA-SP-7011(64)) Avail: CFSTI CSCL 06C

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N69-38265# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
A STRUCTURE OF MAN-MACHINE DIAGNOSTIC INFORMATION SYSTEMS: IMPLICATIONS FOR HUMAN ENGINEERING RESEARCH AND DESIGN Final Report, Dec. 1967 – Jan. 1968
Robert G. Mills Dec. 1968 21 p refs
(AD-689766; AMRL-TR-68-134) Avail: CFSTI CSCL 5/8

A conceptual framework for describing and analyzing man-machine diagnostic systems (e.g., maintenance and check-out, command and control systems) is suggested. Emphasis is placed on information, its nature and its flow within such systems. The more prominent variables affecting diagnostic processes and performance (i.e, inferential decision-making) and their topological interrelationships are described. A graphic representation of the processes involved in these systems is provided in terms of a generalized flow diagram. Information parameters are critical in determining the quality of diagnostic performance in man-machine diagnostic systems. It is concluded that research concerning the relationships between information parameters and diagnostic performance, as well as the more traditional (i.e., display/control) research, is required to develop human engineering criteria applicable to the design of diagnostic systems. Several examples of relevant human engineering research problems are discussed. Author (TAB)

N69-38276*# Naval Aerospace Medical Inst., Pensacola, Fla.
DIRECTIONAL DIFFERENCES IN VISUAL ACUITY DURING VERTICAL NYSTAGMUS
W. Carroll Hixson and Jorma I. Niven 16 Jul. 1969 11 p Sponsored in part by Army Aeromed. Res. Lab.
(NASA Order R-93)
(NASA-CR-105972; NAMI-1079) Avail: CFSTI CSCL 06S

Twenty naval aviator candidates were exposed to four ramp velocity test profiles generated by the Human Disorientation Device. The head orientation was such that the γ (left-right) axis was on the earth-vertical rotational center of the device, with the resulting α_y pitch stimulation eliciting vertical nystagmus which was recorded on all four profiles. During two of the profiles, the subjects were required to observe a visual target consisting of a vertically aligned series of dots and to report the duration of the period where dot fusion or target blur occurred as a result of the vertical nystagmus. It was found that during pitch forward angular acceleration ($+\alpha_y$) resulting in nystagmus with a slow component upward, the loss of visual acuity was of a significantly longer duration than that present during stimulation in the opposite direction. Directional differences in the vertical nystagmus response were also observed. Author

N69-38297# Mitre Corp., Bedford, Mass.
CLASSIFICATION OF CONSOLE DISPLAYS AND THEIR FUNCTIONAL APPLICATIONS
Thomas A. Mackey May 1969 117 p refs
(Contract F19628-68-C-0365)
(AD-689551; MTR-814; ESD-TR-69-123) Avail: CFSTI CSCL 5/8

The document presents a survey of console display devices and their functional applications for the USAF command and control environment. In particular, console display devices which enhance man/machine interaction are emphasized. Author (TAB)

N69-38324# Technische Hochschule Hannover (West Germany). Inst. fuer Strahlenbiologie.
FLASH PHOTOLYSIS AND PULSE RADIOLYSIS IN RADIATION BIOLOGICAL RESEARCH
E. G. Niemann Apr. 1969 102 p refs In GERMAN
(BMwF-FBK-69-11) Avail: AEC Depository Libraries

Possibilities and limitations of flash photolysis and pulse radiolysis techniques in the investigation of primary processes in biological systems are discussed. The design of two flash light sources, an x-ray flash equipment, and a new method of kinetic absorption spectroscopy is described in detail, which is especially adapted to the investigation of radiation biological problems. The final discussion concerns some open questions in the reaction kinetics of biological systems and investigates the possibility of their solution by means of flash photolysis and pulse radiolysis. Author (NSA)

N69-38350# Johns Hopkins Univ., Baltimore, Md. Dept. of Radiological Sciences.
CELL PROLIFERATION STUDIES IN CONTINUOUSLY

IRRADIATED MAMMALS - EFFECT OF AGE
Jacob I. Fabrikant 30 Apr. 1969 16 p refs Presented at the 9th Ann. Hanford Symp. on Radiation Biology of the Fetal and Juvenile Mammal, Richland, Wash.
(Contract AT(30-1)-3970)
(NYO-3970-25; CONF-690501-1) Avail: CFSTI

It was demonstrated that the radiation effects in certain of the cell renewal systems (hemopoietic stem cells, semiferous epithelium, and thymus) in mice depend, in part, on the cell population structure and proliferative characteristics of the tissue at the time of exposure. The maintenance of cell proliferation and differentiation under the stress of γ and x radiation injury is governed, in part, by the homeostatic control mechanisms which regulate cell reproduction. Thus the kinetics of depopulation and recovery from radiation injury would depend on the integrity of the internal and external factors which determine the availability of normal stem cells, proliferating precursor cells, and possible feedback mechanisms, such as hormonal agents, regulating cell population size and differentiation. Since these factors change with age and particularly during the early period of growth and maturation of the animal, it would be expected that the radiation response would be affected by the age of the host and thus the cell population structure, and the extent of perturbations of the system by radiation.
NSA

N69-38355# Florida State Univ., Tallahassee. Dept. of Psychology.
STUDIES IN THE USE OF IONIZING RADIATIONS AS STIMULI Progress Report, 1 Jun. 1968 – 31 May 1969
James C. Smith 29 May 1969 12 p refs
(Contract AT(40-1)-2903)
(ORO-2903-44) Avail: CFSTI

Investigations were conducted on the use of x rays and γ rays as noxious unconditioned stimuli in conditioning aversions to preferred taste solutions. Effects of the circadian rhythm on radioinduced aversion to saccharin in rats were studied. Radio-induced aversion to sucrose solutions was studied using a bar press reinforcement. Gamma rays and x rays were used as a warning stimulus for subsequent shock to show that rats, monkeys, and pigeons elicit immediate responses on the onset of the ionizing radiation. Light, beta rays, and gamma rays were compared as effective stimuli to elicit either flight behavior or electrical responses from the visual system of the moth, Heliothis zea. NSA

N69-38357# Southwest Texas State Coll., San Marcos. Dept. of Biology.
EFFECTS OF RADIATIONS ON THE GENETIC SYSTEMS OF ORGANISMS IN RELATION TO THEIR PHYSICAL AND BIOCHEMICAL SYSTEMS Progress Report, 1 Sep. 1968 – 1 May 1969
Mary L. Alexander 1 May 1969 12 p refs
(Contract AT(40-1)-3844)
(ORO-3844-1) Avail: CFSTI

The mutagenicity of short-strand DNA and a comparison of the ability of single and double-stranded DNA to induce recessive lethal mutations were studied by incorporating 0.5 ml of heated (above 65°C) or cold DNA into the medium on which Drosophila eggs were placed and allowed to develop from larvae to the adult stage. Appropriate controls were also maintained. The results indicated that the mere reduction in the size of the DNA molecule did not increase its mutagenicity. It was also concluded that mutagenicity by DNA is dependent upon some factor or factors other than the size of the macromolecules and therefore the preparation of the samples of the same type of DNA cannot account for the variations in results observed for DNA feeding. The efficiency of ethylenimine and x rays and combinations of the two mutagens for producing genetic damage in Drosophila germ cells were studied and results are reported. NSA

N69-38369# McDonnell-Douglas Astronautics Co., Newport Beach, Calif. Astropower Lab.
PATTERN RECOGNITION OF EEG TO DETERMINE LEVEL OF ALERTNESS Technical Progress Report, 2 Nov. 1968 – 14 May 1969
William B. Martin Jun. 1969 22 p refs
(Contract N00014-68-C-0277)
(AD-689536; DAC-60538-52) Avail: CFSTI CSCL 06/16

This report documents the work accomplished during the second reporting period in applying the principles of pattern recognition technology to the analysis of EEG. Using EEG recordings, two sleep state classification systems, based on inputs derived from spectral analysis, have been designed, simulated, and tested. One system was based on an overnight sleep record of a single subject; the other included, in the design data base, sleep EEG patterns taken from six subjects. The resulting pattern recognition systems were tested on sleep records from ten subjects and yielded reasonable classification of the training and test tapes. However, to reduce confusion between certain sleep stages (i.e., 1 + REM, 3 + 4, ...) additional inputs may be required to supplement the basic frequency information. To assist in enhancing the classification ability of the recognition system a smoothing operation has been developed that monitors the systems output response and minimizes isolated misclassifications. In addition, a computer program to isolate and identify K complexes and sleep spindles is under development and shows considerable promise. Author (TAB)

N69-38410*# Department of Health, Education, and Welfare, Cincinnati, Ohio. Consumer Protection and Environmental Health Service.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Apr. – 30 Jun. 1969
R. B. Read, Jr. Aug. 1969 34 p refs
(NASA Order R-36-015-001)
(NASA-CR-106007; QPR-17) Avail: CFSTI CSCL 06C

Studies are centered upon the establishment and the evaluation of a rapid procedure for preparing spores for dry heat inactivation, obtaining ancillary data on water sorption with the spores of B. substilis var niger, and indentifying isolates from Apollo 10. A statistical application to thermal death time of the spores is included.
Author

N69-38420*# Fenwal, Inc., Ashland, Mass.
FIRE PROTECTION AND RECOMPRESSION SYSTEMS FOR A HYPOBARIC RESEARCH CHAMBER Final Report, Jul. – Dec. 1967
William Brown (Fairchild Hiller Corp., Farmingdale, N.Y.), Edward Ledoux, William Mailloux, John A. Brown(AMRL), Earl L. Sayre et al (AMRL), Courtney A. Metzger (AMRL) Wright-Patterson AFB, Ohio AMRL Feb. 1969 38 p Sponsored in part by NASA Prepared for Fairchild Hiller Corp. Farmingdale, N.Y.
(Contract F33615-67-C-1833; Proj. 6373)
(NASA-CR-106011; AMRL-TR-68-146) Avail: CFSTI CSCL 06K

A fire detection-extinguishment system and automatic rapid recompression system for a hypobaric man-rated chamber to enhance the safety of human subjects confined to aerospace simulators in altered gaseous atmospheres are described. Installation, operation, and maintenance instructions are included. The UV detectors are used for detection of flame or arcing; reaction systems are triggered either automatically by the UV detector or by manual electric or manual hydraulic switching. The UV and smoke detectors set off audio and visual alarms during manual modes of monitoring the chamber interior. Water supply for 60 sec is maintained at 100 psi gage. The installation design of the water sprinkler system into the chamber meets requirements for both water pattern and flow rate of 7.5 gal/min/ft^2 of floor area.

Measured response time between automatic detector sensing and water delivery at a transient pressure of 35 psi gage at the sprinkler was 110 msec. An on-off-reset-repeat detection-control system is used. All systems use 24 V dc power; conventional and emergency power sources are discussed. An array of installed alarms is described. Author

N69-38428# Office of Atomic Energy for Peace, Bangkok (Thailand).
DETERMINATION OF MANGANESE, COPPER, ZINC, IRON, AND MOLYBDENUM IN ANIMAL BLOOD SAMPLE BY NEUTRON ACTIVATION ANALYSIS
Darakarnt Chamnirokasarnt 1969 5 p refs
(THAI-AEC-22) Avail: AEC Depository Libraries

The technique of neutron activation analysis was applied to determination of Mn, Cu, Zn, Fe, and Mo in animal blood samples as supplied by IAEA for intercomparison purposes. One gram of the sample was found to contain 0.3786 ± 0.0019 μg Mn, 1.4146 ± 0.0025 μg Cu, 16.5713 ± 0.0607 μg Zn, 2.7025 ± 0.0446 mg Fe, and 0.0305 ± 0.0013 μg Mo. Author (NSA)

N69-38449# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR).
SOME CHANGES IN THE MOTOR REACTIONS OF PERSONS WORKING IN CONDITIONS OF CONTINUOUS RADIATION EXPOSURE
A. V. Barabanova 1968 18 p refs In RUSSIAN
(A-AC-82/G/L-1255) Avail: AEC Depository Libraries

Persons who were chronically exposed to radiation during work, such as reactor and accelerator personnel, medical radiologists, persons working with phosphors and with industrial flaw detectors, and scientists and technicians working with unsealed sources, were examined to determine the radiation-induced changes in their motor reactions. Electromyographic and stabilographic methods were used; the electromyograms were recorded by a 15-channel electroencephalograph. The data represented an expansion of the standard values; they were very unstable. The motor reactions followed the general worsening tendency of the nervous system and of the organism as a whole. Persons exposed to 50 to 70 rad seemed to increase their bioelectric activity; this tendency was more marked in persons suffering from chronic radiation sickness who also exhibited considerable regulatory instability in their vascular and motor reactions. Author (NSA)

N69-38491*# TRW Systems Group, Redondo Beach, Calif.
HEAT PIPE DEVICES FOR SPACE SUIT TEMPERATURE CONTROL Research Report, 30 Jun. 1966–1 Sep. 1968
Arnold P. Shlosinger Washington NASA Oct. 1969 56 p refs
(Contract NAS2-3817)
(NASA-CR-1400; TRW-06462-6005-R0-00) Avail: CFSTI CSCL 06K

Investigations performed to develop techniques for control of temperature in extravehicular space suits have provided technological knowledge of general applicability to temperature control systems. This report summarizes this knowledge. Other reports, referenced in this report, deal with the specific application to space suits and the related materials research performed. A heat pipe thermal switching device is described, and test results presented. Techniques for bonding of capillary structures to solid substrates are discussed. Recommendations for suitable bonding techniques are provided. Heat pipes of flexible materials are described, and data resulting from experimentation with flexible heat pipes presented. Concepts for preventing freezing or for restart of frozen heat pipes are discussed and experiments, demonstrating feasibility of one of these concepts, are described and data presented. Author

N69-38501# Texas Univ., Dallas. Southwestern Medical School.
INFLUENCE OF THE PHYSICAL STATE OF CHROMATIN ON NUCLEIC ACID AND PROTEIN SYNTHESIS AND ON RADIATION SENSITIVITY OF CELL DIVISION Progress Report, 1 Sep. 1968–31 Aug. 1969
Mary Esther Gaulden 30 May 1969 7 p refs
(Contract AT(40-1)-3546)
(ORO-3546-7) Avail: CFSTI

The induction of pseudo-diapause in grasshopper embryos was accomplished by placing the embryos at 11°C. The embryos could be stored up to six months. The effects of the degree of condensation of chromatin on its ability to synthesize DNA, RNA, and protein were studied in cultured grasshopper neuroblast by altering the ionic strength of the medium. Data indicate that the condensation of the chromosomes before or just after initiation of RNA synthesis prevented or greatly reduced synthesis, but synthesis was slightly reduced when chromatin was condensed after the cell was well into the process. Uptake was observed of the labeled amino acids at all stages from early telephase to late propase, but not during midmitotic periods. Investigations on the effects of X-radiation on uptake of tritium-labeled thymidine in late prophase and metaphase showed no uptake in metaphase and uptake only in those prophase cells that were delayed. Studies on the effects of colchicine on the mitotic rate of neuroblasts revealed that cells in middle prophase underwent reversion to earlier stages. Telophase and interphase cells were also greatly retarded. It was concluded that telophase, middle prophase, and the first part of late prophase were the most sensitive phases of the cell cycle to X-rays. NSA

N69-38502# City Coll. of the City of New York. Brooklyn College.
LETHAL SECTORING AND APPARENT INTERCHROMOSOMAL EFFECTS IN YEAST Annual Progress Report, 1968
1968 5 p refs
(Contract AT(30-1)-3998)
(NYO-3998-1) Avail: CFSTI

Pooled haploid budding lethal sector data showed highly enhanced recombination after x irradiation; however, when each of the individual clones was analyzed, normal map distance was observed Studies to elucidate the mechanism of radioresistance of yeast are briefly described; in one area, mutations deficient for budding cell resistance were sought using a variety of mutagens. Six mutants were found. The medium in which overnight refrigeration occurred were found to be important. If stored overnight in water at 8°C prior to exposure to growth conditions, the resulting budding cells were found to be of the same sensitivity as the interdivisional cells. All budding cells were indistinguishable on the basis of the Feulgen reaction; all showed the same evidence of DNA increase in their nuclei thus indicating that DNA increase of itself was insufficient to confer radioresistance. Azure B staining results indicated that DNA duplication and RNA synthesis were both required for radioresistance in budding yeast. NSA

N69-38514# Georgia Univ., Athens. Dept. of Zoology.
A STUDY OF THE GENETIC COMPONENTS OF GROWTH AND REPRODUCTION AS THEY ARE AFFECTED BY RADIATION, TEMPERATURE, SELECTION, AND THE INTERACTION OF THESE THREE FACTORS Progress Report, 1 Feb. 1968–1 Feb. 1969
1 Feb. 1969 20 p refs
(Contract AT(40-1)-2975)
(ORO-2975-12) Avail: CFSTI

The immediate and possibly cumulative effects of γ radiation and the interaction of radiation, selection, and temperature on reproduction and growth of field mice were studied; the relations between growth, reproduction, and temperature were also

considered. Data are presented in tabular form. Generally, temperature and radiation slightly influenced body weight and composition; temperature effects on the fat component of body weight approached significance. The group held at 90°F (60°, 75°, and 90°F holding temperatures) was discontinued because of lack of offspring. NSA

N69-38527# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR).

EFFECTS OF IONIZING RADIATION ON THE NERVOUS SYSTEM, PART 1

A. K. Guskova, ed. 1968 72 p refs In RUSSIAN

(A-AC-82/G/L-1264) Avail: AEC Depository Libraries

Individual reports are presented on five radiation effects topics: (1) principles of clinico-physiological evaluations of the human nervous system after irradiation; (2) clinico-physiological characteristics of neuro-circulatory dystonic syndrome in radiation sickness; (3) functional state of the heart and control of its activity upon chronic exposure to ionizing radiation; (4) cerebral hemodynamics change after exposure to ionizing radiation; and (5) encephalographic studies on human exposure to low radiation dosage. E.C.

N69-38549# Ocean Systems, Inc., Terrytown, N.Y. Research Dept.

REGION OF NONCOMBUSTION, FLAMMABILITY LIMITS OF HYDROGEN-OXYGEN MIXTURES, FULL SCALE COMBUSTION AND EXTINGUISHING TESTS AND SCREENING OF FLAME-RESISTANT MATERIALS Summary Report No. 2 on Combustion Safety in Diving Atmospheres, 31 Mar. 1967–1 May 1969

Victor A. Dorr and Heinz R. Schreiner 1 May 1969 211 p refs

(Contract N00014-66-C-0149)

(AD-689545) Avail: CFSTI CSCL 6/11

Research during the second and third years of this contract has centered around five general areas: The determination of the region of noncombustion in compressed breathing gases, the determination of the upper flammability limits of hydrogen-oxygen mixtures at superatmospheric pressures, screening of flame resistant materials and recommendations of end-item diving products, full scale combustion tests in the decompression chamber and high-expansion foam fire extinguishing tests. The report also includes an updated survey of the literature and sections on anticipated future studies and apparatus and technique. Author (TAB)

N69-38556# Production Group, United Kingdom Atomic Energy Authority, Annon (Scotland).

RADIOBIOLOGY RESEARCH UNIT, CHAPELCROSS ANNUAL REPORT 1968

J. H. Martin 1969 6 p refs

(PG-Rept-897) Avail: CFSTI/UK

The transfer of the Unit from the Atomic Energy Authority to Dundee University is announced. Work related to the passage of heavy ions through tissue was continued, and studies of biochemical indicators of radiation exposure and on the influence of particulate materials on cell renewal are outlined. NSA

N69-38585# Sandia Corp., Albuquerque, N.Mex.

INFLUENCE OF WEAK ELECTROMAGNETIC FIELDS ON THE CIRCADIAN CYCLE OF HUMANS

Ruetger Wever 1969 11 p refs Transl. into ENGLISH from Naturwissenchaften (Berlin), v. 55, 1968 p 29–32

(SC-T-69-1021) Avail: CFSTI

Based on the shielding studies, the natural electromagnetic fields exert the same effect upon the circadian cycle of man as an artificial electrical 10-Hz field: *Both fields act as an accelerator* upon the periodicity and this accelerating effect increases with a prolongation of the period when the field is absent. Both fields inhibit the internal de-synchronization that can be observed only in the absence of both natural and artificial fields. The natural electromagnetic fields of terrestrial origin can be replaced by artificial electrical 10-Hz fields with regard to their effect upon periodicity. This mutual interchangeability does not mean that the 10-Hz radiation is the only component of the natural fields that acts upon man; yet it is a strong indication that the 10-Hz radiation is an essential component of those fields, *at least as regards the effect* on the circadian periodicity. The experiments show, on the one hand, that the circadian periodicity can also be affected by imperceptible physical errors, and, on the other hand, that previously disregarded factors of our natural environment can have a measurable effect on man. Author (NSA)

N69-38600*# Michael Reese Hospital and Medical Center, Chicago, Ill.

ANALYSES AND MEASUREMENTS OF BLOOD SAMPLES

Eric Reiss Washington NASA Oct. 1969 16 p

(Contract NAS2-4757)

(NASA-CR-1395) Avail: CFSTI CSCL 06P

Details of experimental procedures are given. The radioimmunoassay for parathyroid hormone (PTH) yielded reliable and reproducible measurements in man, and the methods developed in our laboratory are applicable for the investigation of calcium metabolism during weightlessness in space flight. Despite substantial accomplishments, many problems remain. These problems are spelled out in detail. They emphasize the need for ongoing investigations and improvement in currently employed technics. Author

IAA ENTRIES

A69-38320
VISUAL TRANSIENT PHENOMENON: ITS POLARITY AND A PARADOX.
J. F. Bird and G. H. Mowbray (Johns Hopkins University, Applied Physics Laboratory, Silver Spring, Md.).
Science, vol. 165, Aug. 8, 1969, p. 588,589. 14 refs.
PHS Grant No. NB-07226-01.

Study of the elemental response of the eye to individual frequency jumps in the oscillations of a light whose luminance oscillates rapidly around a constant level. The stimulus studied contains one abrupt frequency change, with both time periods shorter than the fusion limit, and both wavetrains long enough to insure that the eye is in a steady state at the time of the period discontinuity and is unperturbed by the stimulus cutoff. When this stimulus is viewed, a transient effect is experienced at the jump in period. The polarity of the transients is discussed. An apparent paradox is described which was noted on adding a short flash simultaneously with the period jump. G.R.

A69-38322
HYPERPHAGIA IN RATS WITH CUTS BETWEEN THE VENTROMEDIAL AND LATERAL HYPOTHALAMUS.
D. J. Albert and L. H. Storlien (British Columbia, University, Dept. of Psychology, Vancouver, Canada).
Science, vol. 165, Aug. 8, 1969, p. 599, 600. 12 refs.
Research supported by the University Research Committee; National Research Council of Canada Grant No. NRC APA 192.

Study of the functional interaction between the lateral (LHA) and ventromedial (VMH) hypothalamic areas in female rats. Bilateral cuts between the VMH and the LHA consistently produced hyperphagia. Hyperphagia occurred slightly less reliably when one of the cuts entered the VMH and only infrequently if one entered the LHA. The results are consistent with other evidence that suggests that fibers originating medially stop eating by inhibiting cells in the LHA. G.R.

A69-38323 *
EPINEPHRINE METABOLISM IN MAMMALIAN BRAIN AFTER INTRAVENOUS AND INTRAVENTRICULAR ADMINISTRATION.
Alan M. Steinman, Stanley E. Smerin, and Jack D. Barchas (Stanford University, School of Medicine, Dept. of Psychiatry, Stanford, Calif.).
Science, vol. 165, Aug. 8, 1969, p. 616,617. 27 refs.
NIH-supported research; Grant No. NGR-05-020-168; Contract No. NR-102-715.

Study of the metabolism of epinephrine in a mammalian brain on the basis of data obtained on animals after isotonic saline was perfused into the cranial vasculature. Epinephrine given intravenously or intraventricularly has a half-life in the brain of the rat of 2 to 2.5 hr. After intravenous administration of the drug, the principal route of metabolism is O-methylation, whereas after intraventricular administration the principal route is conjugation. G.R.

A69-38330
OPTIMAL VISUAL CHARACTERISTICS FOR LARGE SCREEN DISPLAYS.
William H. Ton (Colorado State University, Fort Collins, Colo.).
Information Display, vol. 6, July-Aug. 1969, p. 48-52. 15 refs.

Review of studies in the psychology and physiology of vision in relation to the design of large screen displays. The studies focused on the areas of symbol size and spacing, color usage, coding, registration, refresh rate, and ambient illuminations. The findings are summarized in a series of guideline statements for specific types of display situations. B.H.

A69-38383
EFFECT OF CHRONIC HYPOXIC HYPOXIA ON THE O_2-Hb DISSOCIATION CURVE AND RESPIRATORY GAS TRANSPORT IN MAN.
C. Lenfant, P. Ways, C. Aucutt, and J. Cruz (Washington, University, Dept. of Medicine and Dept. of Physiology and Biophysics, Seattle; Firland Sanatorium, Institute of Respiratory Physiology, Seattle, Wash.; Universidad Peruana, Instituto de Investigaciones de la Altura, Lima, Peru).
Respiration Physiology, vol. 7, June 1969, p. 7-29. 35 refs.
PHS Grants No. HE-08465; No. HE-12174.

The effect of chronic hypoxic hypoxia on the oxygen-hemoglobin dissociation curve and oxygen and carbon dioxide transport was determined in three groups of subjects: residents at altitude, patients with congenital heart disease, and patients with chronic obstructive lung disease. A shift to the right of the oxygen-hemoglobin dissociation curve of normal, nonhypoxic subjects, was found in all subjects of the first two groups. The magnitude of the shift was not related to the hemoglobin concentration. In residents at altitude, it was independent of the duration of the stay. In patients with chronic lung disease, the direction of the shift depended upon the hematocrit, being leftward when hematocrit is normal and rightward in polycythemic patients. Data reveal differences in carbon dioxide transport between the three groups of subjects that corroborate previously reported findings. The causes and mechanisms of the shift are discussed. Low oxygen saturation in the venous blood appears to be the regulating factor, and changes occurring in the concentration of some intracellular constituents seem to be the mechanism of action. The physiological effects of the shift (left and right) are discussed. (Author)

A69-38384
RATE OF O_2 DISSOCIATION FROM O_2Hb AND RELATIVE COMBINATION RATE OF CO AND O_2 IN MAMMALS AT 37°C.
Robert A. B. Holland (New South Wales, University, School of Physiology, Kensington, Australia).
Respiration Physiology, vol. 7, June 1969, p. 30-42. 25 refs.
Research supported by the National Heart Foundation of Australia and Joint Coal Board of New South Wales.

Measurement of the rate at which CO displaces oxygen from combination with oxyhemoglobin solution for different oxygen tensions at 37 deg C. The hemoglobins studied were human adult and fetal, horse, goat, dog, cat, and rabbit. The velocity constant for the dissociation of oxygen from fully saturated hemoglobin, the velocity constant for replacement of oxygen from fully saturated hemoglobin at low CO tensions, and the ratio of the velocity constants for the combination of CO and diatomic oxygen with three-parts saturated hemoglobin were determined from the results. M.M.

A69-38385
RATE AT WHICH CO REPLACES O_2 FROM O_2Hb IN RED CELLS OF DIFFERENT SPECIES.
Robert A. B. Holland (New South Wales, University, School of Physiology, Kensington, Australia).
Respiration Physiology, vol. 7, June 1969, p. 43-63. 26 refs.
Research supported by the National Heart Foundation of Australia and Joint Coal Board of New South Wales.

Measurement of the rate at which CO replaces oxygen from combination with oxyhemoglobin in cells and solution for different species. Red cells studied were those of the adult and newborn

human, rabbit, dog, cat, horse, goat, and toad. At 37 deg C, the cell reaction rate was more affected by the rate in solution than by size of the cells. At lower temperatures, the cell and solution rates were closer together, and at 25 deg C the replacement reaction was as fast in the large cells of the toad as in some mammalian cells. The energy of activation of the replacement reaction in solution was approximately 20 kcal/mole for the three hemoglobins in which it was measured. M.M.

A69-38386
THE EFFECT OF VOLUME HISTORY ON SHUNT FLOW IN EXCISED DOG LUNGS.
Frederick W. Cheney, James D. Parker, and John Butler (Washington, University, School of Medicine, Div. of Chest Diseases, Seattle, Wash.).
Respiration Physiology, vol. 7, June 1969, p. 64-71. 8 refs.
Research supported by Boeing Good Neighbors Fund and University of Washington.

Excised dog lungs were distended with oxygen and perfused with the venous blood of donor dogs. The anatomical shunt flow through the lungs was measured by the oxygen content method. Large shunt flows ranging from 9 to 28 per cent of the total flow were found. The pulmonary arterial pressure for perfusion of the lungs at a constant flow and low venous pressure was significantly lower after inflation from a smaller volume than after deflation from a larger volume to the same alveolar pressure. At an alveolar pressure of 10 cm water, the mean shunt was 18 per cent greater after inflation than after deflation. However, at alveolar pressures of 20 cm water and above, shunt flow was not significantly affected by volume history. The results suggest that the lower pulmonary arterial pressure necessary for perfusion of the excised lung after inflation is not due to shunt channels through areas of atelectasis which can be abolished by a hyperinflation. (Author)

A69-38387
ANALYSIS OF THE PROPERTIES OF PULMONARY SURFACTANT USING MODIFIED WILHELMY BALANCES.
Edith Rosenberg (Royal Victoria Hospital, Dept. of Experimental Surgery; McGill University, Montreal, Canada).
Respiration Physiology, vol. 7, June 1969, p. 72-87. 13 refs.
Research supported by the Medical Research Council of Canada.

In order to establish an objective criterion for identifying pulmonary surfactant on modified Wilhelmy balances, the areas corresponding to the lowest recorded minimum surface tension were measured and expressed in dynes by minutes on a Wilson (W) and an electronic (E) balance. Fresh and lyophilized tracheal lavage from healthy dogs and rats was used as test material. Whenever sufficient material was available from rat lungs, comparable areas approximately 250 dynes by minutes were obtained. The areas from dog lung lavage were always significantly higher even though the minimum surface tension (γ) for dog and rat lungs were comparable. Min γ on the W balance was always lower for fresh lavage than on the E balance. Min γ depended on the quantity of surfactant used regardless of its source. Lyophilization did not appear to change the quality of surfactant (areas of loops) but did produce a quantitative loss. (Author)

A69-38388 *
VENTILATION-PERFUSION INEQUALITY AND OVERALL GAS EXCHANGE IN COMPUTER MODELS OF THE LUNG.
John B. West (NASA, Ames Research Center, Biotechnology Div., Moffett Field, Calif.).
Respiration Physiology, vol. 7, June 1969, p. 88-110. 23 refs.

Study of the effects of increasing ventilation-perfusion inequality on overall gas exchange in digital computer models of the lung. Ventilation/unit volume and perfusion/unit volume were distributed log normally with respect to lung volume. Ventilation-perfusion inequality was found to affect the transfer of carbon dioxide nearly as much as oxygen. The reasons for the misconception that inequality does not interfere with carbon dioxide transfer are discussed. The effects of changing overall ventilation, blood flow, inspired oxygen, hemoglobin concentration, and the acid-base status of the blood were investigated when oxygen uptake and carbon dioxide output were held constant at normal values. In general, mismatch of ventilation and blood flow in a lung caused the arterial oxygen tension to fall and the carbon dioxide to rise. Increasing overall ventilation rapidly restored blood carbon dioxide tensions to normal but improved oxygen tensions little. M.M.

A69-38389
INFLUENCE OF BUBBLE SIZE AND BLOOD PERFUSION ON ABSORPTION OF GAS BUBBLES IN TISSUES.
Hugh D. Van Liew and Michael P. Hlastala (New York, State University, School of Medicine, Dept. of Physiology, Buffalo, N.Y.).
Respiration Physiology, vol. 7, June 1969, p. 111-121. 18 refs.
Contract No. N 00014-68-A-0216.

Development of a mathematical theory to predict the behavior of tissue gas bubbles such as those occurring in decompression sickness. According to the theory, the rate of change of the diameter of a spherical bubble is proportional to the sum of (1) a factor that accounts for the divergence of the paths of molecules as they diffuse outward from the bubble, and (2) a factor that accounts for blood perfusion of the tissues around the bubble. For bubbles of radius below 10 microns, the perfusion factor is negligible in comparison to the divergence factor. This finding and assumptions that unsteady-state effects and surface tension are negligible allow the rate of growth or decay of small bubbles to be approximated by a relatively simple differential equation. According to the equation, rate of radius change is directly proportional to the inert gas partial pressure difference between the inside and the outside of the bubble, inversely proportional to the pressure of the gas inside the bubble, and inversely proportional to the bubble radius. (Author)

A69-38390
THE ROLE OF THE VAGUS NERVES IN THE VENTILATORY RESPONSES TO HYPERCAPNIA AND HYPOXIA IN ANAESTHETIZED AND UNANAESTHETIZED RABBITS.
P. S. Richardson and J. G. Widdicombe (Oxford University, Laboratory of Physiology, Oxford, England).
Respiration Physiology, vol. 7, June 1969, p. 122-135. 18 refs.

Minute volume vs end-tidal carbon dioxide pressure relationships have been determined for anesthetized and unanesthetized rabbits, before and after bilateral cervical vagotomy. Vagotomy depresses and flattens the upper parts of the curves (i.e., the ventilatory response to carbon dioxide is reduced), whether the inspired carbon dioxide mixture is in air, 100 per cent oxygen, or 8 to 10 per cent oxygen. The increase in frequency of breathing due to carbon dioxide is especially depressed. During the maximal response to carbon dioxide the vagotomized rabbits are able to increase ventilation in response to other stimuli. It is concluded that a lung reflex or reflexes is partly responsible for the shape of the minute volume vs carbon dioxide pressure curve in rabbits with intact vagi. (Author)

A69-38412 #
SOME ULTRASTRUCTURAL INDICES OF THE STATE OF MYOCARDIAL CELLS DURING GENERAL HYPOXIA OF THE ORGANISM (NEKOTORYE UL'TRASTRUKTURNYE POKAZATELI SOSTOIANIIA MIOKARDIAL'NYKH KLETOK PRI OBSHCHEI GIPOKSII ORGANIZMA).
Z. G. Tsagareli and G. I. Natsvlishvili (Akademiia Nauk Gruzinskoi SSR, Institut Eksperimental'noi Morfologii, Tiflis, Georgian SSR).
Akademiia Nauk Gruzinskoi SSR, Soobshcheniia, vol. 54, Apr. 1969, p. 233-236. 7 refs. In Russian.

Examination of the ultrastructure of the heart muscle of a group of dogs in various stages of general hypoxia produced by a two-valve

mask containing a constant oxygen content subjected to a constant pressure. The functional state of the myocardium was determined by EKGs. The development of both compensatory-adaptational and dystrophic changes in intracellular components, especially the mitochondria, is noted. V.P.M.

A69-38577 *
IN THE BEGINNING... LIFE ASSEMBLED ITSELF.
Sidney Fox (Miami, University, Institute of Molecular Evolution, Coral Gables, Fla.).
New Scientist, vol. 41, Feb. 27, 1969, p. 450-452.
Grant No. NGR-10-007-008.

Critical analysis of the proposition that the evolution of life involved the creation of order from chaos. Noting that this concept implies the existence of some "vital force" and gives rise to the idea that living systems transcend the laws of physics and chemistry, it is argued that the ability of molecules to order themselves removes the necessity for a vitalistic philosophy. F.R.L.

A69-38728 *
THE CURRENT STATUS OF VESTIBULAR SYSTEM MODELS.
L. R. Young (Massachusetts Institute of Technology, Dept. of Aeronautics and Astronautics, Cambridge, Mass.).
(International Federation of Automatic Control, Symposium on Technical and Biological Problems of Control, Yerevan, Armenian SSR, Sept. 1968.)
Automatica, vol. 5, May 1969, p. 369-383. 29 refs.
Grants No. NsG-577; No. NGR-22-009-156; Contract No. AF 33(615)-5038.

Mathematical description of the human vestibular system for dynamic space orientation, using the identification methods of control theory. The analysis by several investigators building on the available data has led to a biocybernetic model which is useful in predicting man's perceived orientation in space, postural reactions, nystagmus eye movements, and piloting actions based on motion cues. The semicircular canals, which act as angular velocity sensors, have been subjected to a fluid-dynamics analysis. The limitations of the torsion pendulum model of Van Egmond, Groen, and Jongkees are examined, and a quantitative description of adaptation is proposed. An otolith model, responding to linear acceleration forces, is presented and is shown to agree with perception of tilt and translation, eye counter-rolling, and electrophysiological data. Cross-coupling effects are discussed, including the influence of linear acceleration on the semicircular canals. (Author)

A69-38780
NERVOUS CONTROL IN INSECT FLIGHT (DER INSEKTEN-FLUG UND SEINE NERVÖSE STEUERUNG).
Herbert Heran (Würzburg, Universität, Institut für Zoologie (II) und vergleichende Physiologie, Würzburg, West Germany).
(Verband Deutscher Biologen, Jahrestagung, Vienna, Austria, 1966.)
Naturwissenschaftliche Rundschau, vol. 22, Jan. 1969, p. 1-8. 42 refs. In German.

Aerodynamic study of the relation of the nervous system to the musculature of lift and thrust mechanisms in insect flight. Slow-motion photographs are examined, and some flight curves are compared for butterflies, bees, and grasshoppers. It is shown that elevation and depression and promotion and remotion of the wings are modified by mass, elasticity, and air forces in a manner such that they may not be viewed as simple harmonic oscillations. The power and lift thrust must be estimated numerically, since the rapidity of wing motion rules out experimental measurements. The role of the sensory organs on the wings is discussed. These include sensory hairs, campaniform sensillas, scolopal organs, and stretch receptors. It is shown that the more maneuverable the wing, the more numerous the sensory organs found on it. Extrathoracic receptors are examined, and the effects of wind forces on their functioning are examined. B.H.

A69-38782
LIFE AT HIGH TEMPERATURES (DAS LEBEN BEI HÖHERER TEMPERATUR).
Herbert Zuber (Zürich, Eidgenössische Technische Hochschule, Laboratorium für Molekularbiologie, Zurich, Switzerland).
Naturwissenschaftliche Rundschau, vol. 22, Jan. 1969, p. 16-22. 12 refs. In German.

Investigation of the effects of thermal energy on life processes. The utilization of thermal energy in the metabolic processes of the living cell is discussed, and the role of thermal energy as an accelerator of biochemical reactions is noted. The interaction of thermal energy and enzyme action is elaborated, and the function of protein catalysts in an aqueous medium, in the temperature ranges from 0 to 100 deg C, is explained. It is shown that all living organisms must adjust their metabolism within a narrow temperature range in order to survive. Upper temperature boundaries for the maintenance of cellular functioning are examined, and a hypothesis on the origin of thermophilic microorganisms is presented. B.H.

A69-38783
THE SENSE OF TASTE IN MAN (DER GESCHMACKSSINN DES MENSCHEN).
Heinz H. Hofmann (Würzburg, Universität, Institut für Pharmazie und Lebensmittelchemie, Würzburg, West Germany).
Naturwissenschaftliche Rundschau, vol. 22, Feb. 1969, p. 53-62. 127 refs. In German.

Description of the mechanism of human taste perception and of the anatomy of the taste system. Topics discussed include the position of the sense of taste with respect to other senses, the original significance of the sense of taste in primeval and modern man, and general characteristics of the sense of taste. Special attention is given to the perception of sweet, salty, and bitter tastes, and the nature of the role played by taste-stimulating and taste-inhibiting substances is considered. Some attempts made to investigate the sense of taste are described. Z.W.

A69-38784
CONTROL CIRCUITS IN NATURE AND THEIR IMPORTANCE IN HUMAN WORK (REGELKREISE IN DER PHYSIK UND IHRE BEDEUTUNG FÜR DIE MENSCHLICHE ARBEIT).
M. Spreng (Erlangen-Nürnberg, Universität, I. Physiologisches Institut, Erlangen, West Germany).
Naturwissenschaftliche Rundschau, vol. 22, Feb. 1969, p. 62-68. 13 refs. In German.

Examination of the principles of control systems and sensory processing of information data occurring in the course of human work. The servomechanism of the brain-muscle system controlling the contraction and relaxation of the skeletal muscles is described. The reafference principle involving, in addition to the spinal marrow, a large number of so-called nervous switching planes is discussed. Special attention is given to the vegetative systems controlling blood pressure and respiration. The interrelation between the sensory and motor organs is discussed. Some experiments to determine the relative efficiency of particular sensory channels to external stimuli are examined in order to establish the working efficiency of humans. Z.W.

A69-38786
COSMIC ASPECTS OF ORGANIC EVOLUTION—A SUPPLEMENT TO THE CONTRIBUTION BY PROF. G. SIMPSON (KOSMISCHE ASPEKTE DER ORGANISCHEN EVOLUTION—EINE ERGÄNZUNG ZUM BEITRAG VON PROF. G. SIMPSON).

Franz Baur.
Naturwissenschaftliche Rundschau, vol. 22, Apr. 1969, p. 167, 168. In German.

Discussion of the probability of a biological development leading to human life on another planet. The relative frequency of mutations and the number of evolutionary steps leading from the initial forms of life to *homo sapiens* are considered. It is found that, in spite of the very great number of planets presumably present in the universe, the probability of a biological evolution leading to human life on another planet is virtually zero. G.R.

A69-38787
MOLECULAR BIOLOGICAL ASPECTS OF DEVELOPMENTAL PHYSIOLOGY (MOLEKULARBIOLOGISCHE ASPEKTE DER ENTWICKLUNGSPHYSIOLOGIE).
Franz Duspiva (Heidelberg, Universität, Zoologisches Institut, Heidelberg, West Germany).
(Verband Deutscher Biologen, Jahrestagung, Heidelberg, West Germany, 1968.)
Naturwissenschaftliche Rundschau, vol. 22, May 1969, p. 191-202. 70 refs. In German.

Study of the physiology of the growth of an organism in terms of decisive enzyme reactions. A review of new trends in cellular evolution studies includes a consideration of the synthesis of biological proteins from DNA. Molecular life processes investigated relate to microorganisms (called protocytes and eucytes) and to their chromosomes. Examples are given of the developmental physiology and embryology of the sea urchin, the worm, the insect, and the amphibian. Some embryonic phases of the sea urchin and the cricket are treated. V.P.M.

A69-38790
EARLY DIAGNOSIS OF POSTTRAUMATIC COMPLICATIONS OF HEAD-BRAIN-TRAUMA (PARTICULARLY OF EPIDURAL AND SUBDURAL HEMATOMAS) WITH THE AID OF ULTRASOUND-ECHO-ENCEPHALOGRAPHY (FRÜHERKENNUNG POSTTRAUMATISCHER KOMPLIKATIONEN DES SCHÄDEL-HIRN-TRAUMAS (INSBESONDERE DES EPI- UND SUBDURALEN HÄMATOMS) MIT HILFE DER ULTRASCHALL-ECHOENZEPHALOGRAPHIE).
F. Láhoda (Städtisches Krankenhaus, Munich, West Germany).
Wehrmedizinische Monatsschrift, vol. 13, Jan. 1969, p. 8-11. 22 refs. In German.

Discussion of the use of echo encephalography in the diagnosis of posttraumatic intercranial hemorrhage or skull and brain trauma. This method, which makes possible the rapid location of the lesion without discomfort to the patient, is shown to be superior to time-consuming neuroradiological techniques as a diagnostic tool for determining the need for surgical intervention or other therapy. It can be used at the site of the accident or during ambulance transport with very little loss of time. B.H.

A69-38791
ALCOHOL OXIDATION AND FUNCTIONAL DISORDERS OF THE CENTRAL NERVOUS SYSTEM PRODUCED BY ALCOHOL AND DRUGS (ÜBER ALKOHOLOXYDATION UND ZENTRALNERVÖSE FUNKTIONSSTÖRUNGEN DURCH ALKOHOL UND PHARMAKA).
W. Pioch (Bonn, Universität, Institut für gerichtliche Medizin, Bonn, West Germany).
Wehrmedizinische Monatsschrift, vol. 13, July 1969, p. 187-192. 23 refs. In German.

Study of the effects of alcohol and drug intake on the ability of drivers to control motor vehicles. Medical tests to determine alcohol concentration in the blood are shown to be unsuitable for the detection of functional disorders of the central nervous system in relation to traffic safety in the lower per-mill range. Comparative electronic nystagmographic studies indicate the presence of a general postrotatory fixation nystagmus in healthy individuals to be a reliable symptom of toxicity due to alcohol and drug intake at this lower level. A simple postrotatory nystagmus test is described as an effective diagnostic tool, if administered by competent examiners. B.H.

A69-38792
IMPAIRMENT OF PILOT EFFICIENCY BY ALCOHOL AND DRUGS—AN ATTEMPT TO DEDUCE STANDARD LIMITS FROM EXPERIMENTAL RESULTS (DIE EINSCHRÄNKUNG DER FLUGTÜCHTIGKEIT DURCH ALKOHOL UND MEDIKAMENTE—VERSUCH EINER EXPERIMENTELLEN ERARBEITUNG VON RICHTWERTEN).
K. E. Klein, H. Brüner, and H. M. Wegmann (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).
Wehrmedizinische Monatsschrift, vol. 13, July 1969, p. 193-199. 30 refs. In German.

Review of experimental results in the determination of alcohol and drug tolerance levels in pilots by means of blood tests. The established tolerances were used for a comparative study of function impairment in pilots and automobile drivers at a given alcohol concentration in the blood, which was shown to be equivalent to the effects of a given tested drug intake. From a forensic point of view it is shown that impairment of function occurs at a 0.2 per cent concentration of alcohol in the blood, or from an equivalent intake of a number of standard dosages of frequently prescribed medicaments. These data are offered as a basis for air-safety legislation regulating the amount of time which should be required to elapse before users of alcohol or specified drugs may function as aircrew members. B.H.

A69-38838 #
RHEOGRAPHIC STUDY OF THE BLOOD CIRCULATION OF THE FOREARM AFTER TIGHTENING WITH PNEUMATIC CUFF.
A. Tsenov (Research Institute of Neurology and Psychiatry, Sofia, Bulgaria).
Bolgarskaia Akademiia Nauk, Doklady, vol. 22, no. 6, 1969, p. 713-716. 5 refs.

Discussion of the possible causes of a decrease in the general blood supply occurring simultaneously with a considerable increase in the rheogram amplitude. Longitudinal rheograms of the forearm of healthy and sick subjects, with completely intact blood circulation, were recorded by means of ribbon-shaped electrodes, while the forearm was simultaneously tightened with a pneumatic cuff attached to a manometer and a rubber bulb. It is shown that only the fluctuations in the lumen of the vascular system of a given organ are recorded in rheography. The data obtained by rheography furnish information about the tonus of the vessel, as a result of which the blood supply of the organ studied can be assessed only indirectly. Z.W.

A69-38895
BIOLOGICAL CLOCKS.
Michael Menaker (Texas, University, Austin, Tex.).
BioScience, vol. 19, Aug. 1969, p. 681-689, 692. 19 refs.

Study of the rhythmic behavior of organisms in their natural habitat, showing that the internal physiological "clock" which underlies circadian rhythms "keeps time" for organisms by maintaining the temporal organization of their various physiological, biochemical, and behavioral activities. It is shown that at present there is very little direct evidence pertaining to the physiological nature or anatomical location of such a biological clock. A number of animal experiments are reported based on a physical model of cyclical changes in terms of a simple physical oscillator. The model is based on the behavior of a nonlinear spring with a mass attached at one end and the other end attached to a rigid surface. The recurring

oscillations are grouped into a rhythm, and a curve of the rhythm is drawn representing the path of the mass as a function of time. The repeating unit of the rhythm constitutes a cycle, and the length of time required to repeat one cycle constitutes a period. By means of this model the general properties of daily rhythms are studied, and the endogenous nature of these rhythms is established. The role of external and internal environments on the adaptive functions of rhythmic behavior is discussed. It is believed that further investigation of the nature of circadian rhythms will show that rhythmic adaptation confers many different kinds of selective advantage to organisms which possess these rhythms. B.H.

A69-38897
STIMULUS SENSITIVITY AND STIMULUS INTENSITY CONTROL.
Julian Silverman, Monte Buchsbaum, and Robert Henkin (U.S. Public Health Service, Washington, D.C.).
Perceptual and Motor Skills, vol. 28, Feb. 1969, p. 71-78. 21 refs.

Hypothesis of a systematic relationship between averaged cortical evoked response (AER) characteristics and performance in traditional threshold procedures. Averaged evoked responses to light flashes and performances on a battery of psychophysical tasks were measured in 20 normal volunteers. Subjects with one AER pattern were sensitive to low-intensity stimulation; subjects with another AER pattern exhibited the opposite response tendency. The results are interpreted in terms of a theoretical construct regarding a stimulus-intensity control mechanism in the central nervous system. V.P.M.

A69-38898
THEORETICAL MODEL FOR LATERAL INHIBITORY INTERACTION IN THE HUMAN RETINA.
Willard L. Brigner (Duke University, Durham, N.C.).
Perceptual and Motor Skills, vol. 28, Feb. 1969, p. 119-142. 36 refs. NSF Grant No. GB-4916.

Development of a theoretical model capable of providing a systematic account of simultaneous brightness contrast unattainable so far with the existing models. In addition to integrating the empirical aspects of simultaneous brightness contrast, the model predicts that the magnitude of perceived brightness contrast will be greater at a corner than along an edge. Empirical data consistent with this prediction are presented. A further prediction that the perceived magnitude of brightness contrast will increase as the angular size of the corner decreases is tested. In a theoretical analysis, an approximation to the experimental results is obtained when contrast effects due both to the predicted effect of angle size and the well-known effect of inducing-field area are considered. V.P.M.

A69-38899
ADAPTATION TO REARRANGED EAR-HAND COORDINATION.
H. H. Mikaelian (Connecticut College, New London, Conn.).
Perceptual and Motor Skills, vol. 28, Feb. 1969, p. 147-150. 7 refs. Contract No. N 0014-67-C-0466.

Plasticity of ear-hand coordination for ten subjects was explored with exposure to auditory rearrangement entailing 30 deg rotation of the interaural axis produced by electronic pseudophones. The results show that ear-hand coordination changes to compensate for the distortion; however, the per cent change is not of the same order of magnitude as that usually discerned in adaptation to visual rearrangement. (Author)

A69-38900
DEPTH DISTORTIONS IN BINOCULAR FIELDS.
Walter C. Gogel and Robert E. Newton (California, University, Santa Barbara, Calif.).
Perceptual and Motor Skills, vol. 28, Feb. 1969, p. 251-257. 15 refs. Research supported by the University of California; NIH Grant No. 1-R01-MH1565-01.

The introduction of misleading size cues between binocularly presented objects can result in a distortion of the binocular visual field. The effect of this primary distortion upon the perceived depth of extraneous objects (objects not used in generating the primary distortion) was studied when both the primary distortion and the extraneous objects involved vertical separations. It was found that the perceived depth between the extraneous objects (the secondary distortion) was affected by the presence of the primary distortion. From the present and previous studies, it can be concluded that the secondary distortion is directly related to the primary distortion for either horizontal or vertical separations of the objects in both the distortions. This result is discussed as an example of the "adjacency principle." (Author)

A69-38901
DYNAMOMETER MEASUREMENTS OF MUSCLE FUNCTION DURING PERIODS OF DECREASED ACTIVITY AND REDUCED CALORIC AND PROTEIN INTAKE (MUSKELFUNKTIONSPRÜFUNGEN MIT HILFE VON DYNAMOMETERMESSUNGEN UNTER EINFLUSS MANGELNDER AKTIVITÄT UND RESTRIKTIVER CALORIEN- UND EIWEISSAUFNAHME).
W. Wirths (Max-Planck-Institut für Ernährungsphysiologie, Dortmund, West Germany).
Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 27, no. 2, 1969, p. 116-132. 28 refs. In German.

Results of dynamometer measurements of muscular strength (pressure and tension) in 12 male and 15 female subjects during a two-week period of inactivity with a restricted caloric and protein intake. The activity was confined to 8 hours of sleep and 16 hours of sitting. The 1820-calorie diet consisted of the following: 71 g protein (41 g of it being of animal origin), 63 g pure fat, 235 g carbohydrates, 945 mg calcium, 1380 mg phosphorus, 29.3 mg iron, 3.8 g salt, 835 mcg vitamin A, 1.3 mg thiamin, 1.5 mg riboflavin, 12.3 mg niacin, and 255 mg vitamin C. Of the 1820 calories offered the male subjects consumed an average of 1388 calories daily, while the female subjects consumed 1055 calories daily. The males consumed an average of 56 g of protein per day, while the female subjects consumed 44 g per day, of which 37 g were animal protein in the case of the men and 29 g were animal protein in the case of the women. Average muscular strength measurements showed a decrease of 26.5 per cent in the men and 28.4 per cent in the women. An average decrease of 25 per cent in bodily strength was noted. B.H.

A69-38902
A BICYCLE ERGOMETER FOR INVESTIGATING THE EFFECT OF ECCENTRIC EXERCISE WITH ARMS AND LEGS--A NEW MODIFICATION OF THE KROGH'S BICYCLE ERGOMETER.
F. Bonde Petersen (Copenhagen, University, Dept. of Physical Medicine, Laboratory for Clinical Physiology of Exercise, Copenhagen, Denmark).
Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 27, no. 2, 1969, p. 133-137. 7 refs.

An induction clutch is combined with Krogh's (1913) bicycle ergometer. In this way it is possible to transmit known work loads from an electromotor to the Krogh ergometer. The work load can be calibrated by the magnetic brake of the Krogh ergometer, and when the direction of revolution is reversed, it is possible for the subject to brake the ergometer by either the arms or the legs. It is concluded that the device may be useful in investigating the eccentric dynamic work with arms and legs. (Author)

A69-38903
EFFECT OF EXERCISE ON HEPATIC CHOLESTEROL OF RATS FED DIETS HIGH IN SATURATED OR UNSATURATED FATS.
Philip D. Gollnick and Albert W. Taylor (Washington State University, Dept. of Physical Education for Men, Exercise of

Physiology Laboratory, Pullman, Wash.).
Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 27, no. 2, 1969, p. 144-153. 36 refs.
NIH Grant No. HE-08262.

Study of the effects of exercise on the hepatic cholesterol levels of rats fed high fat diets. Rats were fed diets containing 24.2 per cent coconut or corn oil or an equal mixture of each for 14 to 18 weeks. Half of the animals in each dietary group were exercised by running in motor-driven work wheels throughout the entire experimental period. Comparisons between sedentary groups revealed that hepatic cholesterol and excretion of digitonin precipitated sterols in the feces increased (P less than 0.01) as the per cent of unsaturated fat (corn oil) in the ingested food increased. No change in plasma cholesterol occurred in the sedentary rats in response to the three diets. Hepatic cholesterol of the exercised groups was significantly less (from P less than 0.05 to P less than 0.01) than that of their respective control groups. However, the group fed the corn oil diet had a significantly higher (P less than 0.01) liver cholesterol after exercise than did the exercised group fed the coconut oil diet. Liver lipid was reduced (P less than 0.01) by exercise in the corn oil and mixed groups. Plasma cholesterol and sterol excretion were unchanged by the exercise program. P.G.

A69-38904
EFFECTS OF TRAINING UPON THE MAXIMAL OXYGEN UPTAKE OF MIDDLE-AGED MEN.
Paul M. Ribisl (Kent State University, Applied Physiology Research Laboratory, Kent, Ohio).
Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 27, no. 2, 1969, p. 154-160. 11 refs.

An experimental group of 15 middle-aged males participated in a 5-month endurance running program. Significant improvement was observed in maximal oxygen uptake, maximal ventilation, maximal oxygen pulse, and 2-mile run time. A highly trained group of 10 middle-aged males who had begun running 2 years or more was compared with the experimental group. The highly trained group was superior in maximal oxygen uptake, maximal ventilation, maximal oxygen pulse, and the 2-mile run time both before and after the 5-month training program of the experimental group. Each of the measures used in this study shows a characteristic age decline after maturity, and it appears that these trends are reversible with training. (Author)

A69-38905
DIFFERENTIAL ACCLIMATISATION AS A FUNCTION OF DURATION OF EXPOSURE.
C. G. Williams and A. J. A. Heyns (Chamber of Mines, Johannesburg, Republic of South Africa).
Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 27, no. 3, 1969, p. 198-211. 10 refs.

Study of the length of time required to achieve the highest degree of acclimatization in two groups of men who were acclimatized at either one of two temperature conditions—namely, 32.2 deg/33.9 deg C (wet bulb/dry bulb) or 33.9 deg/35.5 deg C (wet bulb/dry bulb). The acclimatization procedure consisted of 4 hours of work daily at a metabolic rate of 5 kcal/min for a duration of 12 days. Changes in rectal temperature and heart rate followed immediately upon the first exposure to, and work in, heat. Judged by the rectal temperature reactions, the process of acclimatization was completed within 8 days. An extension of the period of acclimatization to between 9 and 12 days had no effect on the state of acclimatization acquired by the subjects after an 8-day procedure. With an acclimatization procedure shorter than 8 days the men were not fully acclimatized. Acclimatization procedures of either 4, 5, or 6 days duration (at 32.2 deg C wet bulb) induced a degree of acclimatization in the subjects which proved to be adequate to enable them to work with body temperatures similar to those of fully acclimatized men, for periods of either 1, 2, or 3 hours, respectively, in the test environment. (Author)

A69-38906
A NON-LINEAR SOLUTION OF THE OXYGEN CONDUCTANCE EQUATION—APPLICATIONS TO PERFORMANCE AT SEA-LEVEL AND AT AN ALTITUDE OF 7350 FT.
Roy J. Shephard (Toronto, University, School of Hygiene, Dept. of Physiological Hygiene, Toronto, Canada).
(Physiology of Stress Symposium, Niagara Falls, N.Y., Sept. 1, 2, 1968.)
Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 27, no. 3, 1969, p. 212-225. 11 refs.

Derivation of a nonlinear solution of the oxygen conductance equation, and application of the technique used to the processes of oxygen uptake at sea level and at altitude. It is pointed out that, at the altitude of Mexico City, the decrease in overall conductance is less than would be predicted from the decrease in ambient pressure, since the normal shape of the oxygen dissociation curve has the effect of increasing blood conductance. M.M.

A69-38907
RETICULOCYTE COUNTS BEFORE AND AFTER EXERCISE—TRAINED VS. SEDENTARY.
Ben R. Londeree and Thomas Allaire (Purdue University, Dept. of Physical Education for Men, Human Performance Laboratory, Lafayette, Ind.).
Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 27, no. 3, 1969, p. 226-229. 13 refs.

Reticulocyte count comparison on ten trained and ten sedentary college males before and immediately after heavy exercise and following 15 min of recovery. No significant differences occurred within or between groups; in fact, all means were within the normal range. Previous findings are discussed. It is concluded that a physiologically significant increase in reticulocytes does not occur as a result of exercise or training and therefore cannot be a mechanism for increased maximal oxygen uptake. (Author)

A69-38908
THE INFLUENCE OF NOISE ON THE HEART RATE AND THE O_2 CONSUMPTION UNDER MEDIUM-TO-HARD PHYSICAL LOADS (ZUM EINFLUSS VON LÄRM AUF DIE HERZFREQUENZ UND DEN O_2-VERBRAUCH BEI MITTELSCHWERER PHYSISCHER BELASTUNG).
M. Quaas, M. Lohs, W. Geiler, and U. Platzbecker (Medizinische Akademie, Institut für Arbeitshygiene, Dresden, East Germany).
Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 27, no. 3, 1969, p. 230-238. 26 refs. In German.

Experimental investigation of ten young men with regard to the influence of noise (90-dB broadband sound) on the heart rate and on the O_2 consumption in the presence of a simultaneous stress of 6 mkgp/sec. It is noted that noise results in an additional increase in the functioning of the examined quantities. The heart rate increases, its dispersion grows larger, the O_2 consumption increases, the preparatory phase and the recreation phase of the oxygen consumption are accelerated, and the quotient of recreation is increased. The duration of the noise effect has a certain influence on the scope of these alterations. An explanation of the noise-effected alterations can be sought in the central nervous control mechanisms. According to our results, limiting noise values are not to be attributed to the otologic component alone, because the reactions of other physiologic functions must also be taken into consideration. In a series of examinations of subjects exposed to noise, complete clinical examinations are found to be as necessary as otologic examinations. (Author)

A69-38909
INVESTIGATION OF CATECHOLAMINE SECRETION IN THE URINE AS A CRITERION OF EMOTIONAL STRESS—VIBRATION LOADING, FILM PRESENTATIONS, AND TESTING SITUATIONS (UNTERSUCHUNGEN ZUR FRAGE DER CATECHOL-

AMINAUSSCHEIDUNG IM HARN ALS KRITERIUM FÜR EMOTIONALEN STRESS UNTER VERSCHIEDENEN UMGEBUNGSBEDINGUNGEN--VIBRATIONSBELASTUNG, FILMDARBIETUNGEN UND PRÜFUNGSSITUATION).

H. Starlinger, W. Hawel, and J. Rutenfranz (Max-Planck-Institut für Arbeitsphysiologie, Psychologische Abteilung, Dortmund, West Germany).

Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 27, no. 1, 1969, p. 1-14. 17 refs. In German.

Study of catecholamine secretion in the urine of nine male patients during six two-hour research periods in which they were subjected to sinusoidal vibrations with a frequency of 5 Hz and an amplitude of plus or minus 3.03 (i.e., an acceleration of 0.3 g) every half-hour for the first three two-hour periods, with the second three two-hour periods used as controls. The same subjects were also given urine tests before, during, and after a film presentation in which an adventure film and a serious film were shown. No significant findings in catecholamine secretion were noted. Twenty-nine subjects were also tested for catecholamine secretion in the urine during three different test experiences, in which four subjects took their final oral examination for a secondary school diploma, twenty-three subjects took driver's license tests, and two subjects took their final apprenticeship examinations. The only significant rise in catecholamine secretion was observed in the urine of the candidates for the driver's license, and in that of the candidates for the apprenticeship certificate. B.H.

A69-38910

ANALYSIS OF CHANGES IN THE PULSE RATE DURING EXERCISE AND RECOVERY AFTER SIXTY HOURS OF COMPLETE FASTING.

V. Brodan and E. Kuhn (Ústav pro Výzkum Výživy Lidu, Prague, Czechoslovakia).

Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 27, no. 1, 1969, p. 25-33. 13 refs.

Assessment of the increase in the pulse rate at the onset of standard exercise on a bicycle ergometer, and of the drop during recovery after 60 hours of fasting. In a group of seven men the pulse rate was broken down into a rapid (vagus, central) component of the pulse increment and a slow (peripheral, sympathetic) component, and the velocity constants of these components were obtained. Fasting led to a rise in the pulse increment and to an increase in the sympathetic component at the expense of the component of vagus inhibition. The results confirm that acute fasting leads to a drop in physical performance, while under normal conditions analogous changes are caused by more intense exercise. V.P.M.

A69-38911

DETERMINANTS OF OXYGEN CONSUMPTION AND MAXIMUM OXYGEN INTAKE OF BANTU AND CAUCASIAN MALES.

C. H. Wyndham and A. J. Heyns (Chamber of Mines, Johannesburg, Republic of South Africa).

Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 27, no. 1, 1969, p. 51-75. 27 refs.

Oxygen consumptions were measured on 80 Caucasian and 45 Bantu young adult males at a number of different work rates both while stepping on and off a bench and bicycling. In both groups gross body weight accounted for 70 per cent of the differences between individuals in this measurement; height was negatively correlated and accounted for 4 per cent of the differences between individuals; lean body mass had no significant influence. However, the Bantu have significantly lower oxygen consumptions, which indicates that they are mechanically more efficient in stepping and bicyling. Seventy per cent of the differences between individuals in maximum oxygen intake is in Caucasians due to differences in body weight but only 18 per cent in Bantu recruits. After a period of good food and regular work this figure rises to 50 per cent in the Bantu. The regression line for the Bantu recruits is significantly lower than that for Caucasians, but after the induction period the regression line for the Bantu is not significantly different from that for the Caucasians over most of the weight range. (Author)

A69-38912

MEASUREMENT AND MECHANISMS OF INERT GAS NARCOSIS.

Peter B. Bennett (Ministry of Defence /Navy/, Royal Naval Physiological Laboratory, Portsmouth, Hants., England).

(Virginia Mason Research Center, Oceanographic Commission of Washington, and Pacific Science Center, Symposium on Physiological Problems of Man-in-the-Sea, Seattle, Wash., July 26, 27, 1968.)
Journal of Occupational Medicine, vol. 11, May 1969, p. 217-222. 15 refs.

Results of physiological and psychological measurements of the effects of high pressure on both man and animals. In addition to decompression sickness, factors such as the pressure itself, respiratory embarrassment, the narcotic action of the gases breathed, helium tremble and convulsions, and possibly other factors must be considered. Tests of narcosis have varied between arithmetic, estimation of depth, pursuit-meter performance, sorting playing cards, and many others. Results are cited which may be regarded as support for the hypothesis that nitrogen and inert gas narcosis are due to the adsorption of the narcotic agent on cell membranes. Oxygen too may act in a similar manner. F.R.L.

A69-38913

ADVANCES IN DECOMPRESSION RESEARCH.

H. R. Schreiner (Union Carbide Corp., Linde Div., Research Laboratory, Tonawanda, N.Y.).

(Virginia Mason Research Center, Oceanographic Commission of Washington, and Pacific Science Center, Symposium on Physiological Problems of Man-in-the-Sea, Seattle, Wash., July 26, 27, 1968.)
Journal of Occupational Medicine, vol. 11, May 1969, p. 229-237. 27 refs.

Discussion of the results of decompression research on the transport of inert gases in the body. Preliminary experimental evidence shows that surfacing ratios reflect the relative decompression advantage of various inert gases only after a saturation exposure. When exposure to a given inert gas is short of saturation, the significance of the surfacing ratio as a determinator of decompression success must be modified by considering the rate of perfusion of the compartments in which supersaturation exists, and the nature of the inert gas breathed. It is concluded that when two gases produce identical, or nearly identical, surfacing ratios the injury produced by the more soluble gas will be greater than that caused by the less soluble gas. B.H.

A69-38914

EXPERIMENTS ON DECOMPRESSION BUBBLES IN THE CIRCULATION USING ULTRASONIC AND ELECTROMAGNETIC FLOWMETERS.

Merrill P. Spencer, Spencer D. Campbell, J. Leon Sealey, Frank C. Henry, and Jon Lindbergh (Virginia Mason Research Center, Seattle, Wash.).

(Virginia Mason Research Center, Oceanographic Commission of Washington, and Pacific Science Center, Symposium on Physiological Problems of Man-in-the-Sea, Seattle, Wash., July 26, 27, 1968.)
Journal of Occupational Medicine, vol. 11, May 1969, p. 238-244. 9 refs.
NIH Grants No. HE-10258; No. HE-12015.

Results of investigations on objective detection of circulating gas emboli moving in flow streams of the larger arteries and veins, using the ultrasonic Doppler shift principle and the square-wave electromagnetic flowmeter with perivascular cuffs around the descending aorta and inferior vena cava. Characteristic bubble signals first appeared on the Doppler ultrasonic flowmeter as "chirps" superimposed on the otherwise normal arterial and venous blood flow signal and on the electromagnetic flowmeter output as transient

"spike" voltages. The absorbing power for gaseous emboli by the pulmonary vasculature of the lungs is considered to be extensive. F.R.L.

A69-38915
DETECTION OF GAS EMBOLI ASSOCIATED WITH DECOMPRESSION USING THE DOPPLER FLOWMETER.
M. F. Gillis, M. T. Karagianes, and P. O. Peterson (Battelle Memorial Institute, Pacific Northwest Laboratories, Environmental and Life Sciences Div., Richland, Wash.).
(Virginia Mason Research Center, Oceanographic Commission of Washington, and Pacific Science Center, Symposium on Physiological Problems of Man-in-the-Sea, Seattle, Wash., July 26, 27, 1968.)
Journal of Occupational Medicine, vol. 11, May 1969, p. 245-247. 10 refs.
Research supported by the Battelle Memorial Institute; AEC Contract No. AT (45-1)-1831.

Description of the operation of the ultrasonic Doppler flowmeter for detecting circulating gas emboli in vessels of animals subjected to decompression. The flowmeter operates on the principle that sound scattered from moving objects suffers a shift in frequency when measured by a stationary observer. The instrument consists basically of a transducer containing two identical piezoelectric crystals, an external crystal exciter, and receiver-demodulator circuits. Three basic types of transducers are used: (1) a perivascular (implanted) type for monitoring internal vessels in animals, capable of functioning for months *in vivo*, (2) a transcutaneous type, allowing the detection of flow in peripheral vessels in a completely atraumatic manner, and (3) a catheter type for monitoring vena cava flow in animals and man without thoracotomy. Some experiments are reported on both animals and humans, proving the Doppler flowmeter capable of detecting circulating gas emboli associated with rapid decompression. Because the data are in the form of an audio signal, the instrument is readily adaptable to telemetric methods, permitting its use on unrestrained, unanesthetized animals throughout and following decompression procedures. B.H.

A69-38916
INTRAVASCULAR GAS EMBOLI—A SELECTED LITERATURE CRITIQUE.
Robert F. Bond (American Heart Association, New York, N.Y.; Bowman Gray School of Medicine, Dept. of Physiology, Winston-Salem, N.C.).
(Virginia Mason Research Center, Oceanographic Commission of Washington, and Pacific Science Center, Symposium on Physiological Problems of Man-in-the-Sea, Seattle, Wash., July 26, 27, 1968.)
Journal of Occupational Medicine, vol. 11, May 1969, p. 248-251. 25 refs.
Research supported by the North Carolina Heart Association: PHS Grants No. 5-T 1-HE-5362; No. 5-T 2-5049; No. HE-08886; No. HE-5392.

Critical review of the literature on intravascular gas emboli. Early nonclinical decompression experiments are described which demonstrated that such emboli could produce death in animals. Attention is given to the clinical use of intravenous gas emboli, and to the clinical and nonclinical use of intra-arterial gas emboli. F.R.L.

A69-38917
PHARMACOLOGIC AGENTS IN THE PREVENTION OF DECOMPRESSION SICKNESS.
Spencer D. Campbell and Merrill P. Spencer (Virginia Mason Research Center, Seattle, Wash.).
(Virginia Mason Research Center, Oceanographic Commission of Washington, and Pacific Science Center, Symposium on Physiological Problems of Man-in-the-Sea, Seattle, Wash., July 26, 27, 1968.)
Journal of Occupational Medicine, vol. 11, May 1969, p. 252-256. 11 refs.
NIH Grants No. HE-10258; No. HE-12015.

Study demonstrating the effectiveness, in guinea pigs, of a combination of heparin and papaverine nebulized in carbogen as a prophylactic in decompression sickness. The study is based on the hypothesis that a smooth muscle relaxant and a bronchodilator nebulized into inspired air during decompression will enhance nitrogen elimination by increasing alveolar ventilation perfusion and permeability. Results indicate that the efficacy of nebulized medications and water in reducing severe symptoms of decompression sickness may be due to the enhancement of nitrogen elimination, thus reducing nitrogen pressure in the blood and tissues. B.H.

A69-38918
PLATELETS AS AN ETIOLOGICAL FACTOR IN EXPERIMENTAL DECOMPRESSION SICKNESS.
R. B. Philp and C. W. Gowdey (Western Ontario, University, Dept. of Pharmacology, London, Ontario, Canada).
(Virginia Mason Research Center, Oceanographic Commission of Washington, and Pacific Science Center, Symposium on Physiological Problems of Man-in-the-Sea, Seattle, Wash., July 26, 27, 1968.)
Journal of Occupational Medicine, vol. 11, May 1969, p. 257, 258.

Discussion of experiments on rats designed to investigate the possible role of platelets in the pathology of decompression sickness. Rats paired according to weight were subjected to decompression sickness and appropriately studied 24 hours (thrombocytopenic rats) or five days (for thrombocytosis) after injection of antiplatelet serum. The experiments suggest that aeroembolism results in the disappearance of some circulating platelets, probably by stimulating the formation of platelet thrombi. F.R.L.

A69-38919 *
THE DESIGN OF PHYSICAL ACTIVITY PROGRAMS FOR INDUSTRY.
Benjamin C. Duggar (Bio-Dynamics, Inc., Cambridge, Mass.) and Glenn V. Swengros (Fitness, Inc., Washington, D.C.).
(American Industrial Hygiene Conference, St. Louis, Mo., May 17, 1968.)
Journal of Occupational Medicine, vol. 11, June 1969, p. 322-329. 34 refs.
Contract No. NASw-1428.

Review of the evidence relevant to the recommendation of physical activity programs for selected employees as a routine component of occupational health programs. The state-of-the-art in physical activity programs is described, and a plea is made for industry to take the leadership in conducting the needed research in techniques to postpone the onset of degenerative diseases. The evidence shows that this is both scientifically prudent and economically feasible. M.M.

A69-38920
SURFACE ELECTROMYOGRAPHY FREQUENCY ANALYSIS AS A DIAGNOSTIC TOOL.
Don B. Chaffin (Michigan, University, Dept. of Industrial Engineering, Ann Arbor, Mich.).
(Industrial Medical Association, Annual Meeting, 53rd, San Francisco, Calif., Apr. 22-25, 1968.)
Journal of Occupational Medicine, vol. 11, Mar. 1969, p. 109-115. 6 refs.

Application of surface electromyography (EMG) frequency analysis for the diagnosis of normal skeletal muscle contraction, overfatigued muscle contraction, and pathological muscle or nerve contraction. Two classifications of pathological muscle contraction were studied—namely, the myopathic, in which the muscle tissue produces dysfunction, and the neuropathic, in which dysfunction is produced by the somatic or central nervous system. The role of clinical EMG in confirming these diagnoses is outlined, and it is concluded that surface EMG, interpreted by frequency analysis, is a diagnostic tool of enormous potential for the industrial physician,

since it is easily performed, is painless to the patient, and records significantly higher frequencies for many common neuropathies and myopathies than for asymptotic subjects. B.H.

A69-38921
EXPECTED BIOLOGICAL RESPONSES TO WEIGHTLESSNESS.
Frank B. Salisbury (Utah State University of Agriculture and Applied Science, Plant Science Dept., Logan, Utah).
BioScience, vol. 19, May 1969, p. 407-410. 16 refs.

Formulation of theoretical principles for the prediction of biological responses to weightlessness. A table is shown giving a breakdown of cellular phenomena and predicted response to four gravitational conditions, derived from earth-based and satellite-based experiments. It is concluded that gross gravity responses should be closely observed in satellite experiments. The effects of prolonged weightlessness on cellular metabolism and subsequent growth and response are shown to be uncertain in their predictability, and of the greatest importance for further knowledge about cell metabolism and growth. For a study of gross biological effects due to responses at the cellular level, it is suggested that plants, because of their well-known geotropic responses, are more suitable subjects than animals for biological experiments in weightlessness. B.H.

A69-38922
BIOCRYSTALLOGRAPHY—AN INTERDISCIPLINARY CHALLENGE.
Lawrence J. King (New York, State University, College of Arts and Science, Geneseo, N.Y.).
BioScience, vol. 19, June 1969, p. 505-518. 169 refs.
Research supported by the State University of New York.

Discussion of advances in the knowledge of biocrystallography as related to organic form and structure. Attention is given to liquid crystals, crystallinity of polymers, ordered crystal growth or epitaxy, inclusion compounds, electrical properties of crystals, generalized crystallography, the origin of prelife compounds from adsorption and polymerization on minerals, and biological ultrastructure, differentiation, and development. Numerous model systems are indicated or examined, and it is noted that their further exploration may, perhaps, lead to a better understanding of the origin and development of biological form. M.M.

A69-38965 #
ROLE OF ALDOSTERONE AND HYDROCORTISONE IN THE CONTROL OF THE SODIUM METABOLISM OF THE ORGANISM (ROL' AL'DOSTERONA I GIDROKORTIZONA V REGULIATSII OBMENA NATRIIA V ORGANIZME).
M. G. Kolpakov, G. S. Chudnovskii, and I. Sh. Shterental' (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Fiziologii, USSR).
Akademiia Nauk SSSR, Doklady, vol. 186, June 11, 1969, p. 1228-1231. 7 refs. In Russian.

Investigation of sodium metabolism as a factor contributing to the normal level of water-salt homeostasis in a group of three adrenalectomized male dogs. The animals received 70 meq of sodium and 19 meq of potassium daily in food; aldosterone doses of 0.5 mg/kg and hydrocortisone doses of 1 mg/kg were introduced daily into their urinary bladders to substitute for the functions of removed adrenal glands. A sharp suppression of the sodium metabolism was established in the dogs prior to aldosterone and hydrocortisone administration, as a result of gradually developing adrenal deficiency. The sodium metabolism of the dogs was restored or substantially improved after the administration of these drugs. V.Z.

A69-38968
THE TREATMENT OF HANDLING-QUALITIES RATING DATA.
S. A. Mudd (Gettysburg College, Gettysburg, Pa.).
Human Factors, vol. 11, Aug. 1969, p.321-329. 11 refs.

Comparison of quatitative techniques for evaluating handling-qualities rating data to yield useful information at a low computation cost. The analysis-of-variance technique is applied to determine whether ratings taken from a typical handling qualities study are due to systematic differences in vehicle dynamics or to sampling and measurement errors. Information for estimating the reliability of ratings is provided, and it is shown that difference thresholds can be obtained directly from the data and can be used to modify Newell's (1963) pilot sensitivity curve to conform to conventional psychophysics. B.H.

A69-38969 #
OPTIMUM KNOB DIAMETER.
James V. Bradley (New Mexico State University, Las Cruces, N. Mex.).
Human Factors, vol. 11, Aug. 1969, p. 353-360. 5 refs.

Study of the relationship between the control knob diameter and operation time to determine the diameter, or range of diameters, for which operation time is at a minimum. It is concluded that for smooth (nondetented), single rotation cylindrical knobs, operation time will be minimized, regardless of frictional resistance, by using a knob diameter of 2 in. Diameters down to 1 in. can be used without greatly increasing operational time if the friction resistance is moderate. With heavy frictional resistance, the diameter cannot be reduced below 1.5. B.H.

A69-38970 #
UTILIZATION OF MULTIPLE CUES IN PAIRED COMPARISONS.
James V. Bradley (New Mexico State University, Las Cruces, N. Mex.).
Human Factors, vol. 11, Aug. 1969, p. 361-378. 14 refs.

Formulation of several hypotheses as to the psychological process followed in extracting and combining information. A mathematical model is constructed on the basis of each hypothesis, and, using empirical data for the relative frequencies of correct identification in the single-difference cases, the relative frequency of correct identification in the corresponding multiple-difference case is predicted. These predicted relative frequencies are then compared with actual data obtained for these multiple-difference cases, thus testing the validity of the mathematical model as a predictor and yielding evidence as to the validity of the hypothesis. M.M.

A69-38971 #
QUANTIFYING HUMAN PERFORMANCE FOR RELIABILITY ANALYSIS OF SYSTEMS.
William B. Askren (USAF, Human Resources Laboratory, Wright-Patterson AFB, Ohio) and Thaddeus L. Regulinski (USAF, Institute of Technology, Wright-Patterson AFB, Ohio).
Human Factors, vol. 11, Aug. 1969, p. 393-396. 7 refs.

A general mathematical model of the probability of errorless human performance was derived and equated to human reliability for time-continuous tasks. The application of this model and the implications of the time-to-first-human-error (TTFHE) concept were tested with data collected using a laboratory vigilance task. The error data were ordered, and through classical inference theory the underlying density functions were isolated and tested for goodness of fit. Weibull, gamma, and log-normal distributions emerged as relevant; normal and exponential distributions were rejected. The relevant distribution parameter values were applied to the general mathematical model, and predictions were made of human performance reliability for the task. It is concluded that this is a feasible and meaningful way to quantify human performance for time-continuous tasks for use in reliability analyses of systems. (Author)

A69-38976
VISUAL INFORMATION AND EVOKED RESPONSES FROM THE LEFT AND RIGHT HEMISPHERES.

Monte Buchsbaum and Paul Fedio (National Institutes of Health, National Institute of Neurological Diseases and Blindness, Laboratory of Psychology, Bethesda, Md.).
Electroencephalography and Clinical Neurophysiology, vol. 26, Mar. 1969, p. 266-272. 17 refs.

Investigation of electrographic patterns evoked from the left and right hemisphere by visual and verbal stimuli. Average evoked responses to verbal and nonverbal stimuli were recorded from left and right occipital EEG leads in ten normal right-handed subjects. Although the two types of stimuli were carefully matched for physical properties, their evoked potential waveforms could be differentiated by means of a computational technique utilizing replicate evoked responses. Average evoked response waveforms for verbal and nonverbal stimuli were more different from the left hemispheric lead than from the right. Verbal stimuli had shorter average evoked response latencies. It is noted that hemispheric differences in the average evoked responses are consistent with the hypothesis that the cerebral hemispheres in man assume an asymmetrical role in governing cognitive behavior. P.G.

A69-38977
THE INFLUENCE OF HIGH OXYGEN PRESSURE ON THE ELECTRICAL ACTIVITY OF THE BRAIN.
D. Harel, D. Kerem, and S. Lavy (Hebrew University, Hadassah Medical School and Hadassah University Hospital, Jerusalem, Israel).
Electroencephalography and Clinical Neurophysiology, vol. 26, Mar. 1969, p. 310-317. 22 refs.
Research supported by the National Council for Research and Development.

Investigation of the origin and site of hyperbaric oxygen convulsions. The electrical activity of an intact rabbit brain in curarized animals was studied with the help of electrodes implanted in cortical and subcortical areas, and the EEG was continuously recorded before, during, and after seizures. Early abnormal cerebral activity, consisting of runs of slow waves or bursts of sharp waves, was most frequently recorded from cortical leads. There was no constant focus in any particular cortical area examined, neither was their appearance simultaneous in several structures. In one half of the animals, the early abnormal activity developed into generalized discharge. Occasionally, early changes were first recorded in subcortical areas, spreading to the cortex and other adjacent subcortical areas. In conformity with previous experimental work carried out by other investigators, the reported results show that no brain structure plays a particular role in the genesis and development of hyperbaric oxygen seizures, neither could any area be demonstrated as particularly sensitive in their production. P.G.

A69-38978
COMBINED TELEPHONE AND RADIOTELEMETRY OF THE EEG.
J. Hanley, J. R. Zweizig, R. T. Kado, W. R. Adey, and L. D. Rovner (California, University, Brain Research Institute, Space Biology Laboratory, Los Angeles, Calif.).
Electroencephalography and Clinical Neurophysiology, vol. 26, Mar. 1969, p. 323, 324.
PHS Grant No. 5-PO7-FR-257; Contract No. AF 49(638)-1387.

Description of equipment for multichannel local radiotelemetry of the EEG, combined with onward transmission of the EEG data by telephone as frequency-modulated audio subcarriers from the radio receiver located in the subject's house. Records are presented from a normal 10-year-old child, and are free from major artifacts. On-line spectral analysis was performed, together with acquisition of paper and analog magnetic tape records. P.G.

A69-38979
EFFECTS OF STIMULATING RETICULAR FORMATION, HIPPOCAMPUS AND SEPTUM ON SINGLE CELLS IN THE POSTERIOR HYPOTHALAMUS.
Nachum Dafny and Shaul Feldman (Hebrew University, Hadassah Medical School and Hadassah University Hospital, Jerusalem, Israel).
Electroencephalography and Clinical Neurophysiology, vol. 26, June 1969, p. 578-587. 17 refs.
NIH-supported research.

Study of the effects exerted by extrahypothalamic structures—namely, the reticular formation and hippocampus—on the sensory responsiveness of posterior hypothalamic neurones. Experiments performed on 24 cats are reported. Results show that the stimulation of the reticular formation facilitated the spontaneous activity of some units, and inhibited that of others, producing an "ascending" compound histogram. Stimulation of the hippocampus or the septum had predominantly inhibitory effects, and produced no pattern of firing. The data obtained indicate that the extrahypothalamic structures studied, which participate in the "limbic system/midbrain circuit," have an important effect on the spontaneous activity and responsiveness of the hypothalamic neurones to sensory stimuli. B.H.

A69-38986
LOW-FREQUENCY NOISE THRESHOLDS.
N. S. Yeowart (Boeing Co., Renton, Wash.), M. E. Bryan, and W. Tempest (Salford, University, Dept. of Electrical Engineering, Audiology Research Unit, Salford, Lancs., England).
Journal of Sound and Vibration, vol. 9, May 1969, p. 447-453. 12 refs.

Determination of the absolute threshold of hearing for octave bands of noise with center frequencies from 125 to 4 Hz. The results show that the noise threshold behaves in a similar fashion to the tone threshold, but below 32 Hz noise thresholds are more sensitive by a small but significant amount. A hypothesis is advanced that from about 15 Hz downward the detection process changes and depends on the hearing of individual pressure peaks in the signal presented. Approximate calculations and some experiments on electrical detector circuits with some of the known properties of the ear both agree reasonably with the experimental result that for the 4-Hz octave the noise threshold is 4.1 plus or minus 0.5 dB more sensitive than the tone threshold. (Author)

A69-39034 #
A REAL-TIME HYBRID SOLUTION OF HUMAN BODY DYNAMICS USED TO SIMULATE ZERO-g ACTIVITY.
Larry M. Hunt (Martin Marietta Corp., Systems Research Dept., Denver, Colo.).
Journal of Spacecraft and Rockets, vol. 6, June 1969, p. 752-755.

Description of a servo-driven simulator, controlled by a hybrid computer, which provides motion to the human system equivalent to that experienced in a zero-g environment. This simulation technique has been used to study self-induced rotation and astronaut mobility in the presence of contact and jet thrustor forces. F.R.L.

A69-39049
MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII).
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968. 232 p. In Russian.

CONTENTS:

EFFECT OF THE INTRODUCTION OF HIGH-POLYMER DNA ON THE NUCLEIC ACID CONTENT IN RADIATION SICKNESS DYNAMICS (VLIIANIE VVEDENIIA VYSOKOPOLIMERNOI DNK NA SODERZHANIE NUKLEINOVYKH KISLOT V DINAMIKE LUCHEVOI BOLEZNI). N. I. Kerova and S. G. Laz'ko (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR), p. 14-22. 13 refs. (See A69-39050 21-04)

DYNAMICS OF VARIATIONS IN THE AMINOTRANSFERASE ACTIVITY IN THE ORGANS AND TISSUES OF THE

RABBIT DURING THE DEVELOPMENT OF RADIATION SICKNESS (DINAMIKA IZMENENIIA AKTIVNOSTI AMINOTRANSFERAZ V ORGANAKH I TKANIAKH KROLIKA V PROTSESSE RAZVITIIA LUCHEVOI BOLEZNI). V. V. Tsybul'skii (Odesskii Meditsinskii Institut, Odessa, Ukrainian SSR), p. 23-30. (See A69-39051 21-04)

CHOLESTEROL-PROTEIN METABOLISM UNDER NORMAL CONDITIONS AND DURING RADIATION DAMAGE (OBMEN KHOLESTERINPROTEIDOV V NORME I PRI LUCHEVOM PORAZHENII). E. F. Sopin and I. S. Shapovalova (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR), p. 56-61. 13 refs. (See A69-39052 21-04)

INCREASING THE RADIATION SENSITIVITY OF THE NERVOUS SYSTEM BY ENZYME POISONS AFFECTING THE OXIDATION PROCESSES (O POVYSHENII RADIOCHUVSTVITEL'NOSTI NERVNOI SISTEMY FERMENTNYMI IADAMI, NARUSHAIUSHCHIMI OKISLITEL'NYE PROTSESSY). P. F. Minaev, V. I. Kontorova, O. F. Logvinova, A. P. Mironova, and A. I. Chukhrova (Akademiia Nauk SSSR, Institut Biofiziki, Moscow, USSR), p. 62-69. (See A69-39053 21-04)

CERTAIN LAWS OF CHANGE IN ENZYME ACTIVITY UNDER THE ACTION OF IONIZING RADIATION (O NEKOTORYKH ZAKONOMERNOSTIAKH IZMENENIIA AKTIVNOSTI FERMENTOV PRI VOZDEISTVII IONIZIRUIUSHCHEGO IZLUCHENIIA). I. V. Savitskii (Odesskii Meditsinskii Institut, Odessa, Ukrainian SSR), p. 70-74. 12 refs. (See A69-39054 21-04)

EFFECT OF X-RAYS ON THE ALPHA-AMILASE AND ALPHA-GLUCANOPHOSPHORYLASE ACTIVITY IN TISSUES (VLIIANIE RENTGENOVSKIKH LUCHEI NA AKTIVNOST' AL'FA-AMILAZY I AL'FA-GLIUKANFOSFORILAZY TKANEI). A. S. Borisova (Odesskii Meditsinskii Institut, Odessa, Ukrainian SSR), p. 75-79. (See A69-39055 21-04)

OXIDATIVE PHOSPHORYLATION AND THE THIAMINE PYROPHOSPHATE LEVEL IN THE LIVER DUE TO THE ACTION OF X-RAY IRRADIATION (OKISLITEL'NOE FOSFORILIROVANIE I UROVEN' TIAMINPIROFOSFATA V PECHENI PRI DEISTVII RENTGENOVSKOGO OBLUCHENIIA). N. F. Leus (Odesskii Meditsinskii Institut, Odessa, Ukrainian SSR), p. 80-83. 13 refs. (See A69-39056 21-04)

CHANGES IN THE SUGAR CONTENT OF THE BLOOD IN ANIMALS AFTER EXPOSURE TO GENERAL X-RAYING (IZMENENIIA SODERZHANIIA SAKHARA V KROVI PRI OBSHCHEM RENTGENOVSKOM OBLUCHENII ZHIVOTNYKH). V. V. Tsvetkova (Kievskii Institut Usovershenstvovaniia Vrachei, Kiev, Ukrainian SSR), p. 102-104. (See A69-39057 21-04)

BIOLOGICAL ACTION OF 120-MEV PROTONS IN A WIDE RANGE OF DOSES (O BIOLOGICHESKOM DEISTVII PROTONOV ENERGIEI 120 MEV V SHIROKOM DIAPAZONE DOZ). I. K. Petrovich, Iu. I. Moskalev, and V. N. Strel'tsova (Ministerstvo Zdravookhraneniia SSR, Institut Biofiziki, Moscow, USSR), p. 110-115. 5 refs. (See A69-39058 21-04)

MEASUREMENT OF THE X-RAY RADIATION IN MICROWAVE DEVICES (IZMERENIE RENTGENOVSKOGO IZLUCHENIIA V SVCh-USTANOVKAKH). B. R. Kirichinskii and V. I. Mirutenko (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR), p. 148-152. 5 refs. (See A69-39059 21-05)

BIOLOGICAL ACTION OF RUBY LASER EMISSION (O BIOLOGICHESKOM DEISTVII IZLUCHENIIA RUBINOVOGO LAZERA). B. R. Kirichinskii, I. P. Evdokimov (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR), and A. A. Gorodetskii, p. 171-176. 24 refs. (See A69-39060 21-05)

SENSITIVITY AND RESISTANCE OF THE NERVOUS SYSTEM TO IONIZING RADIATION (O CHUVSTVITEL'NOSTI I USTOICHIVOSTI NERVNOI SISTEMY K IONIZIRUIUSHCHEI RADIATSII). P. F. Minaev (Akademiia Nauk SSSR, Institut Biofiziki, Moscow, USSR), p. 177-180. (See A69-39061 21-04)

MORPHOLOGICAL CHANGES IN THE INTERNAL ORGANS OF RATS DURING EARLY AND LATER PERIODS FOLLOWING FAST NEUTRON IRRADIATION (MORFOLOGICHESKIE IZMENENIIA VNUTRENNYKH ORGANOV KRYS V RANNIE I OTDALENNYE SROKI POSLE OBLUCHENIIA BYSTRYMI NEITRONAMI). T. B. Gerasimova (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR), p. 210-217. 12 refs. (See A69-39062 21-04)

RADIATION DAMAGE IN INTRAMURAL PLEXES (RADIATSIONNYE POVREZHDENIIA INTRAMURAL'NYKH SPLETENII). Z. Ia. Tkachenko (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR), p. 218-223. 10 refs. (See A69-39063 21-04)

ELECTRON MICROSCOPIC STUDY OF CHANGES IN SOLAR GANGLIA DUE TO GENERAL X-RAYING (ELEKTRONNOMIKROSKOPICHESKOE ISSLEDOVANIE IZMENENIIA GANGLIEV SOLNECHNOGO SPLETENIIA V REZUL'TATE OBSHCHEGO RENTGENOVSKOGO OBLUCHENIIA). N. E. Stklianina (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR), p. 224-228. 5 refs. (See A69-39064 21-04)

A69-39050 #

EFFECT OF THE INTRODUCTION OF HIGH-POLYMER DNA ON THE NUCLEIC ACID CONTENT IN RADIATION SICKNESS DYNAMICS (VLIIANIE VVEDENIIA VYSOKOPOLIMERNOI DNK NA SODERZHANIE NUKLEINOVYKH KISLOT V DINAMIKE LUCHEVOI BOLEZNI).

N. I. Kerova and S. G. Laz'ko (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR).

IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)

Edited by Z. B. Iankovskaia.

Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 14-22. 13 refs. In Russian.

Investigation of the effect of intraperitoneal DNA administration on the DNA and RNA contents in the liver, spleen, and intestinal mucosa of white rats exposed to various X-ray doses. High-polymer DNA was obtained from the thymus of calves, the mucosa and the liver of rabbits, and the spleen and mucosa of white rats. The positive normalizing effect of DNA administration on DNA and RNA contents in these organs of X-rayed rats is noted. The DNA obtained from the organs of white rats was more effective. V.Z.

A69-39051 #

DYNAMICS OF VARIATIONS IN THE AMINOTRANSFERASE ACTIVITY IN THE ORGANS AND TISSUES OF THE RABBIT DURING THE DEVELOPMENT OF RADIATION SICKNESS (DINAMIKA IZMENENIIA AKTIVNOSTI AMINOTRANSFERAZ V ORGANAKH I TKANIAKH KROLIKA V PROTSESSE RAZVITIIA LUCHEVOI BOLEZNI).

V. V. Tsybul'skii (Odesskii Meditsinskii Institut, Odessa, Ukrainian SSR).

IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)

Edited by Z. B. Iankovskaia.

Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 23-30. In Russian.

Investigation of the effect of single large X-ray doses on the aminotransferase activity in the blood serum, liver, kidney, heart, spleen, stomach mucosa, small intestines, cerebrum, lung, marrow, and adrenal gland of several groups of 15 to 17 rabbits. A temporary depression of aminotransferase activity is established in the protein metabolism of the rabbits after exposure to a single X-ray dose of 900 r. V.Z.

A69-39052 #

CHOLESTEROL-PROTEIN METABOLISM UNDER NORMAL CONDITIONS AND DURING RADIATION DAMAGE (OBMEN KHOLESTERINPROTEIDOV V NORME I PRI LUCHEVOM PORAZHENII).

E. F. Sopin and I. S. Shapovalova (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR).
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 56-61. 13 refs. In Russian.

Study of the cholesterol-protein metabolism in the muscles, liver, and cerebrum of both unexposed guinea pigs and guinea pigs exposed to a lethal X-ray dose of 500 r, using tagged acetic acid molecules containing a hydrogen isotope for the cholesterol determination. Widely varying cholesterol and protein contents are established in different tissues of guinea pigs, these contents being markedly lower in the X-rayed animals than in the control animals. V.Z.

A69-39053 #
INCREASING THE RADIATION SENSITIVITY OF THE NERVOUS SYSTEM BY ENZYME POISONS AFFECTING THE OXIDATION PROCESSES (O POVYSHENII RADIOCHUVSTVITEL'NOSTI NERVNOI SISTEMY FERMENTNYMI IADAMI, NARUSHAIUSHCHIMI OKISLITEL'NYE PROTSESSY).

P. F. Minaev, V. I. Kontorova, O. F. Logvinova, A. P. Mironova, and A. I. Chukhrova (Akademiia Nauk SSSR, Institut Biofiziki, Moscow, USSR).
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 62-69. In Russian.

Study of the relation between the oxidation processes in the nervous tissue and the radiation sensitivity of the nervous system in groups of dogs whose cerebellum was X-rayed after administration of sodium arsenate, monofluoroacetate, or monoiodoacetate in the cisterna cerebellomedullaris in order to upset oxidation reactions in nervous tissues. The peruvic acid, citric acid, and gamma-aminobutyric acid contents, and also the oxidative phosphorylation in the mitochondria, are determined in the cerebellum of the dogs. The morphological changes in this cerebellum are also studied. X-ray doses from 1.5 to 4 kr are found to cause much greater changes in the oxidation reactions in the cerebellar tissues after administration of these poisonous compounds than in control samples of X-rayed cerebellar tissues. V.Z.

A69-39054 #
CERTAIN LAWS OF CHANGE IN ENZYME ACTIVITY UNDER THE ACTION OF IONIZING RADIATION (O NEKOTORYKH ZAKONOMERNOSTIAKH IZMENENIIA AKTIVNOSTI FERMENTOV PRI VOZDEISTVII IONIZIRUIUSHCHEGO IZLUCHENIIA).

I. V. Savitskii (Odesskii Meditsinskii Institut, Odessa, Ukrainian SSR).
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 70-74. 12 refs. In Russian.

Investigation of changes in enzyme activity in the liver, kidneys, heart, and cerebrum of rats and rabbits exposed to X-ray doses of 600 or 900 r. The diverse shifts in the activity of different individual enzymes in the same X-rayed organ are noted. Transition of enzymes from the mitochondria largely into the hyaloplasm is found to be one of the characteristics of the mechanism of enzyme activity modification by X rays. V.Z.

A69-39055 #
EFFECT OF X-RAYS ON THE ALPHA-AMILASE AND ALPHA-GLUCANOPHOSPHORYLASE ACTIVITY IN TISSUES (VLIIANIE RENTGENOVSKIKH LUCHEI NA AKTIVNOST' AL'FA-AMILAZY I AL'FA-GLIUKANFOSFORILAZY TKANEI).

A. S. Borisova (Odesskii Meditsinskii Institut, Odessa, Ukrainian SSR).
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 75-79. In Russian.

Determination of the activity of alpha-amilase and alpha-glucanophosphorylase (glucosyl transferase orthophosphate) in the liver tissues and blood serum of a group of 28 rabbits after exposure to a single X-ray dose of 900 r. Alpha-amilase activity increased substantially (to a maximum on the seventh day after exposure) in the liver tissues and decreased in the blood serum of the X-rayed animals. In contrast, the alpha-glucanophosphorylase activity decreased slightly during the first post-exposure days and then increased markedly to a maximum on the seventh day in the liver tissues but remained very low in the blood serum of the X-rayed animals. V.Z.

A69-39056 #
OXIDATIVE PHOSPHORYLATION AND THE THIAMINE PYROPHOSPHATE LEVEL IN THE LIVER DUE TO THE ACTION OF X-RAY IRRADIATION (OKISLITEL'NOE FOSFORILIROVANIE I UROVEN' TIAMINPIROFOSFATA V PECHENI PRI DEISTVII RENTGENOVSKOGO OBLUCHENIIA).

N. F. Leus (Odesskii Meditsinskii Institut, Odessa, Ukrainian SSR).
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 80-83. 13 refs. In Russian.

Investigation of the effect of successive X-ray doses totaling 4500 r on the oxidative phosphorylation of vitamin B_1 (thiamine) in the ultrastructures of the liver tissues of white rats on the first, fifth, and ninth day of the irradiation period and on the twelfth day after its completion. Also studied is the esterification of the inorganic phosphate in the mitochondria of the X-rayed rats due to the energy released in peruviate oxidation. Suppression of thiamine biosynthesis by X-raying is established in all ultrastructures of the liver tissues of the rats. V.Z.

A69-39057 #
CHANGES IN THE SUGAR CONTENT OF THE BLOOD IN ANIMALS AFTER EXPOSURE TO GENERAL X-RAYING (IZMENENIIA SODERZHANIIA SAKHARA V KROVI PRI OBSHCHEM RENTGENOVSKOM OBLUCHENII ZHIVOTNYKH).

V. V. Tsvetkova (Kievskii Institut Usovershenstvovaniia Vrachei, Kiev, Ukrainian SSR).
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 102-104. In Russian.

Investigation of changes in the sugar content of the blood of white rats 2, 12, and 14 hr and 2 to 30 days after exposure to a single X-ray dose of 500 r. The development of hyperglycemia is established in the rats on the second and the thirtieth day after X-raying. This observation is believed to indicate that an increased blood sugar content may be beneficial in the prophylaxis and treatment of radiation damage. V.Z.

A69-39058 #
BIOLOGICAL ACTION OF 120-MEV PROTONS IN A WIDE RANGE OF DOSES (O BIOLOGICHESKOM DEISTVII PROTONOV ENERGIEI 120 MEV V SHIROKOM DIAPAZONE DOZ).
I. K. Petrovich, Iu. I. Moskalev, and V. N. Strel'tsova (Ministerstvo Zdravookhraneniia SSSR, Institut Biofiziki, Moscow, USSR).
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 110-115. 5 refs. In Russian.

Study of the pathological action of single 120-MeV proton doses, ranging from 10 to 1000 rad, and administered at a rate of 0.3 rad/sec, on the blood of a total of 921 rats irradiated in a rotating cylinder. Lethal doses for periods of 7 and 15 days were 864 and 725 rad, respectively, and ranged between 660 and 616 rad over periods from 30 to 240 days. The rats developed leukopenia during the period between the third and fourteenth days after exposure, which gradually subsided over a two-month period. The increased incidence of both benign and malignant tumors in various organs and tissues of irradiated rats is noted. V.Z.

A69-39059 #
MEASUREMENT OF THE X-RAY RADIATION IN MICROWAVE DEVICES (IZMERENIE RENTGENOVSKOGO IZLUCHENIIA V SVCh-USTANOVKAKH).
B. R. Kirichinskii and V. I. Mirutenko (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR).
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 148-152. 5 refs. In Russian.

Description of a technique using X-ray sensitive films with a superimposed aluminum scale for measuring the X-rays emitted during the braking of high-velocity electrons in high-voltage microwave devices such as magnetrons, klystrons, and kenotrons. Recommendations are given as to how ionization dosimeters could be most effectively used in determining the X-ray amounts detected by this technique. Two examples of X-ray emission measurements by this technique, successfully executed where other methods failed, are discussed in detail. V.Z.

A69-39060 #
BIOLOGICAL ACTION OF RUBY LASER EMISSION (O BIOLOGICHESKOM DEISTVII IZLUCHENIIA RUBINOVOGO LAZERA).
B. R. Kirichinskii, I. P. Evdokimov (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR), and A. A. Gorodetskii.
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 171-176. 24 refs. In Russian.

Description of a combined photographic and photometric technique designed for studying the absorption and reflection of ruby laser light incident on biological objects. The technique is applied to an investigation of the EPR spectra of intact and depilated guinea pig skins at room temperature and at liquid nitrogen temperature. Preliminary results of the study suggest the formation of free radicals in the process. V.Z.

A69-39061 #
SENSITIVITY AND RESISTANCE OF THE NERVOUS SYSTEM TO IONIZING RADIATION (O CHUVSTVITEL'NOSTI I USTOICHIVOSTI NERVNOI SISTEMY K IONIZIRUIUSHCHEI RADIATSII).
P. F. Minaev (Akademiia Nauk SSSR, Institut Biofiziki, Moscow, USSR).
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04).
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 177-180. In Russian.

General consideration of the factors determining the reaction of the nervous system to ionizing radiation. The author's studies indicating that biochemical processes associated with functional, morphological, and physicochemical changes in the nerve tissues are the major contributors to the sensitivity and resistance of the nervous system to ionizing radiation are reviewed briefly. The lack of broader studies of the biological effects of radiation is believed to block a closer look into the specific mechanisms of radiation sensitivity and resistance of the nervous system. The absence of a single radiation sensitivity criterion and of a single approach to the radiation sensitivity problem are considered to be further factors impeding advances in this field. V.Z.

A69-39062 #
MORPHOLOGICAL CHANGES IN THE INTERNAL ORGANS OF RATS DURING EARLY AND LATER PERIODS FOLLOWING FAST NEUTRON IRRADIATION (MORFOLOGICHESKIE IZMENENIIA VNUTRENNYKH ORGANOV KRYS V RANNIE I OTDALENNYE SROKI POSLE OBLUCHENIIA BYSTRYMI NEITRONAMI).
T. B. Gerasimova (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR).
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 210-217. 12 refs. In Russian.

Study of the histological changes in the small intestines, stomach, liver, and kidneys of a total of 94 rats which died or were killed at various times after a 144-min exposure to a single fast neutron dose of 400 r. Considerable distrophic and destructive processes, edemas, and hemorrhages are established in these organs a short time after the exposure. These damages were accompanied by compensation reactions of cellular element proliferation during later periods. V.Z.

A69-39063 #
RADIATION DAMAGE IN INTRAMURAL PLEXES (RADIATSIONNYE POVREZHDENIIA INTRAMURAL'NYKH SPLETENII).
Z. Ia. Tkachenko (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR).
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 218-223. 10 refs. In Russian.

Study of the histological and neurohistological changes in the intramural plexes of the esophagus, stomach, and illeocecal region of rabbits 1 hr and 1 to 9 days after exposure to a single ionizing radiation dose of 1400 r. Auerbach's plexus is found to be most susceptible to radiation damage, while the presence of distrophic and even destructive changes, together with reactive changes, was also noted in other nerve plexes by the end of the first day. Schwann's cellular elements, neuroblasts and Dodiel cells of the second type exhibited a higher radiation stability. V.Z.

A69-39064 #
ELECTRON MICROSCOPIC STUDY OF CHANGES IN SOLAR GANGLIA DUE TO GENERAL X-RAYING (ELEKTRONNOMIKROSKOPICHESKOE ISSLEDOVANIE IZMENENIIA GANGLIEV SOLNECHNOGO SPLETENIIA V REZUL'TATE OBSHCHEGO RENTGENOVSKOGO OBLUCHENIIA).
N. E. Stklianina (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR).
IN: MECHANISMS OF THE BIOLOGICAL ACTION OF IONIZING RADIATION (MEKHANIZMY BIOLOGICHESKOGO DEISTVIIA IONIZIRUIUSHCHIKH IZLUCHENII). (A69-39049 21-04)
Edited by Z. B. Iankovskaia.
Kiev, Izdatel'stvo Naukova Dumka (Biofizika i Radiobiologiia, No. 2), 1968, p. 224-228. 5 refs. In Russian.

Study, using an electron microscope, of pathological changes in the solar ganglia of white rats after general exposure to an X-ray dose of 800 r. The various changes observed first in the ganglionic nerve cells shortly after exposure, and then in other cell types of solar ganglia, are discussed. The mitochondria are found to be most susceptible to changes, with the nucleus and the rest of the cell showing less sensitivity. V.Z.

A69-39066 *
HYPEROXIA COMPARED TO SURFACTANT WASHOUT ON PULMONARY COMPLIANCE IN RATS.
David L. Beckman and Harold S. Weiss (Ohio State University, College of Medicine, Dept. of Physiology, Columbus, Ohio).
Journal of Applied Physiology, vol. 26, June 1969, p. 700-709. 56 refs.
Grants No. NGR-36-008-004; No. NsG-295-62.

Study of the effects of 100 per cent diatomic oxygen in the lungs of highly susceptible rats sacrificed before asphyxic death. Direct evaluations were made of pulmonary tissue forces and surface tension via compliance measurements. These were derived from air and saline pressure-volume curves, and by correlating compliance changes with surfactant extracted from the same lung by perfusion-transudation techniques. Several procedures were compared in both normal and edematous lungs. Analysis of the slopes of the pressure-volume curves of the excised lungs indicates that hyperoxia decreased compliance by increasing both tissue and surface retractive forces. It is shown that the effect of diatomic oxygen appears to be due primarily to a decrease in surfactant. The high concentration of diatomic oxygen on pulmonary surfactant is discussed, and a number of other factors that may have influenced the measurement of the quantity of the surfactant are cited. Oxygen toxicity and compliance are considered, and parallel changes in pressure-volume curves between diatomic oxygen exposure and surfactant washout are reported. B.H.

A69-39168 *
MOTION SICKNESS PRECIPITATED IN THE WEIGHTLESS PHASE OF PARABOLIC FLIGHT BY CORIOLIS ACCELERATIONS.
Ashton Graybiel, Robert S. Kennedy, and Robert S. Kellogg (U.S. Naval Aviation Medical Center, Aerospace Medical Institute, Pensacola, Fla.; Rochester, University, Rochester, N.Y.).
Aerospace Medicine, vol. 40, Aug. 1969, p. 819-822. 13 refs.
NASA-supported research.

Study of the susceptibility of human subjects to motion sickness when exposed to Coriolis accelerations in the brief period of weightlessness during a parabolic flight maneuver. The experiment was confined to subjects with an established history of insusceptibility to motion sickness in standard parabolic flights. The results for the 24 subjects tested are summarized in a table. The findings show limited relevance to the stressful accelerations which might be generated in a spacecraft rotating at low velocities. It is demonstrated, however, that familiarity with and insusceptibility to motion sickness in standard parabolic flights were not important determinants in predicting symptoms under exposure to Coriolis accelerations. Experiments in a Barany chair showed a high correlation with susceptibility in the Slow Rotation Room. B.H.

A69-39169
SOME RELATIONS BETWEEN PERSONALITY FACTORS AND JOB PERFORMANCE RATINGS IN RADAR CONTROLLERS.
Samuel Karson (Eastern Michigan University, Ypsilanti, Mich.).
(Aerospace Medical Association, Annual Scientific Meeting, 39th, Miami Beach, Fla., May 6-9, 1968.)
Aerospace Medicine, vol. 40, Aug. 1969, p. 823-826. 5 refs.

The purpose of this study was to determine whether primary or second-order personality questionnaire factors were related to job performance ratings by supervisors and peers in a sample of 568 radar controllers. A Pearson correlation matrix was computed, based on 21 variables which included age, education, motivational distortion, and supervisory and peer ratings as well as the primary factors measured by the personality factor questionnaire. A principal axis factor analysis was completed with rotation to oblique simple structure which yielded eight second-order factors. The results obtained between the criterion ratings and the questionnaire measurements were disappointingly low. The study highlighted the fact that a critical need in the area of evaluating on-the-job performance of radar controllers centers on the problem of developing reliable and valid criteria for this purpose. The development of such criteria is seen as a key issue if objective evaluation of radar controller performance is to be accomplished. (Author)

A69-39170 *
CARBON DIOXIDE BUILD-UP CHARACTERISTICS IN SPACESUITS.
E. L. Michel, H. S. Sharma, and R. E. Heyer (NASA, Manned Spacecraft Center, Houston, Tex.).
(Aerospace Medical Association, Annual Scientific Meeting, 39th, Miami Beach, Fla., May 6-9, 1968.)
Aerospace Medicine, vol. 40, Aug. 1969, p. 827-829.

Description of a method for monitoring carbon dioxide levels in spacesuit research. Summaries of spacesuit carbon dioxide levels obtained in the laboratory during predetermined activity are presented for various spacesuit configurations, indicating that spacesuit carbon dioxide levels can be maintained within physiologically acceptable limits during energy expenditures up to 2000 BTU per hr. B.H.

A69-39171
NEUROLOGICAL STUDY OF SIMULATED DECOMPRESSION IN SUPERSONIC TRANSPORT AIRCRAFT.
J. B. Brierley (Medical Research Council, Neuropsychiatric Research Unit, Carshalton, Surrey, England) and A. N. Nicholson (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
(Aerospace Medical Association, Annual Scientific Meeting, 39th, Miami Beach, Fla., May 6-9, 1968.)
Aerospace Medicine, vol. 40, Aug. 1969, p. 830-833.

Results of a decompression study simulating the effect of a small structural failure in the cabin of an aircraft at 60,000 ft, using 7 monkeys as subjects. Decompression profiles are based on recent data applicable to a supersonic transport. Neurological, electrocortical, and neuropathological data show that during a triangular profile of peak altitude not exceeding 36,000 ft, and of duration not exceeding 8 min above 10,000 ft, the spontaneous electrical activity of the brain is maintained, and there is no subsequent evidence of brain damage. It is considered that for humans such a profile is unlikely to be fatal, nor will it lead to brain damage, providing pulmonary ventilation is maintained. Cabin pressure should therefore remain within this profile in the event of a decompression. B.H.

A69-39172
RADIOBIOLOGICAL FACTORS IN SPACE CONQUEST.
Wright H. Langham (California, University, Los Alamos Scientific Laboratory, Biological and Medical Research Group, Los Alamos, N. Mex.).
Aerospace Medicine, vol. 40, Aug. 1969, p. 834-843. 6 refs.
AEC-supported research.

Summary of available knowledge concerning somatic radiation effects on the human organism with relevance to manned space flights. Early effects include skin erythma and desquamation, prodromal response, hematological depression, early lethality, and decreased fertility or sterility; delayed effects involve permanent skin damage, increased incidence of cataract, increased incidence of leukemia and other neoplastic diseases, and general life shortening. Basic limits for general radiation exposure are discussed, and the need for more knowledge of space radiation phenomena in relation to manned space missions of increasing duration is noted. B.H.

A69-39173 *
DESYNCHRONIZATION AND RESYNCHRONIZATION OF HUMAN CIRCADIAN RHYTHMS.
Jürgen Aschoff (Max-Planck-Institut für Verhaltensphysiologie, Seewiesen, West Germany).
(NATO, AGARD, Aerospace Medical Panel Meeting, Rhode-Saint-Genèse, Belgium, Oct. 25-27, 1967.)
Aerospace Medicine, vol. 40, Aug. 1969, p. 844-849. 24 refs.
Grant No. NsG-259-62.

Circadian rhythms of activity, of body temperature, and of urine excretion have been measured in human subjects, kept in isolation in an underground bunker, either in constant conditions or exposed to artificial light-dark cycles as Zeitgebers. In constant conditions, free-running rhythms synchronous in all functions have been demonstrated as well as cases with internal desychronization. Entrainment to an artificial 26.7-hr day resulted in changes of phase-angle differences as predicted from oscillation theory, whereas exposure to a 22.7-hr day resulted in resynchronization from the Zeitgeber. A group of four subjects showed, in constant conditions, synchronous circadian rhythms during the first 10 days, thereafter desynchronization between one subject and the rest of the group. Shifts of the artificial light-dark cycle by 6 hours were followed by the activity-cycles of the subjects rather immediately; the rhythms of body temperature, however, did not regain their normal phases until several days had elapsed. (Author)

A69-39174 *
AVOIDANCE AND ESCAPE BEHAVIOR CONTROLLED BY ARTIFICIAL GRAVITY.
Fogle C. Clark (North Carolina, University, Dept. of Psychology, Chapel Hill, N.C.; Kentucky, University, Wenner-Gren Aeronautical Research Laboratory, Lexington, Ky.), Wayne L. Martin, Karl O. Lange (Kentucky, University, Wenner-Gren Aeronautical Research Laboratory, Lexington, Ky.), and Richard E. Belleville (Kentucky, University, Wenner-Gren Aeronautical Research Laboratory, Lexington, Ky.; NASA, Office of Space Science and Applications, Washington, D.C.).
Aerospace Medicine, vol. 40, Aug. 1969, p. 850-854. 9 refs.
Grant No. NGL-18-001-003.

Study of the escape behavior of squirrel monkeys subjected to simulated gravity from 1.1 to 2.1 g on a centrifuge. Lever responses reduced gravity, or postponed programmed increases. Avoidance and escape behavior was generated by this procedure and was maintained for many weeks in sessions of two or more hours. The results show that centrifugally-produced gravity in excess of earth gravity has aversive properties. B.H.

A69-39175
MINERAL DYNAMICS DURING HIBERNATION AND CHRONIC IMMOBILITY—A REVIEW.
David S. Bruce and Jacob E. Wiebers (Purdue University, Dept. of Biological Sciences, Lafayette, Ind.).
Aerospace Medicine, vol. 40, Aug. 1969, p. 855-861. 101 refs.

The problem of degenerative bone changes is one of current interest in space medicine. This work summarizes the present understanding of the importance of major minerals to the animal body, as deduced from the scientific literature. The phenomena of hibernation and disuse atrophy are discussed as they relate to organismal homeostasis and to successful chronic-term manned space flight. It is emphasized that more research on the skeletal effects of immobility is necessary. (Author)

A69-39176 *
MOTION SICKNESS SUSCEPTIBILITY UNDER WEIGHTLESS AND HYPERGRAVITY CONDITIONS GENERATED BY PARABOLIC FLIGHT.
Earl F. Miller, II, Ashton Graybiel, Robert S. Kellogg, and Robert D. O'Donnell (U.S. Naval Aviation Medical Center, Aerospace Medical Institute, Pensacola, Fla.; USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 40, Aug. 1969, p. 862-868. 30 refs.
NASA-supported research.

Motion sickness susceptibility for five labyrinthine-defective (L-D) and 25 normal subjects was tested under the force environments encountered in parabolic flight. The L-D subjects were uniformly symptomless, while the normal subjects revealed great inter- and intraindividual differences in susceptibility to motion sickness provoked by standardized head movements during the hypergravic and the weightless phases of the parabolic maneuver while restrained, and during the weightless phase while being rotated in a chair. Four of six subjects tested under the first condition were completely unaffected by the condition while two reacted with symptoms. The second condition provoked severe symptoms in five of the twelve subjects tested and moderate symptoms in one. Fifteen subjects tested under the third condition revealed either a marked increase or decrease in susceptibility to Coriolis acceleration in weightlessness compared to terrestrial baseline measurements. (Author)

A69-39177
ELECTRON MICROSCOPY OF CANINE CEREBELLAR PURKINJE CELLS AFTER RAPID DECOMPRESSION TO A NEAR-VACUUM.
Robert W. Bowman, Julian P. Cooke, and Harold W. Casey (USAF, School of Aerospace Medicine, Brooks AFB, Tex.).
Aerospace Medicine, vol. 40, Aug. 1969, p. 869-873. 25 refs.

Examination of cerebellar Purkinje cells in 10 experimental and three control adult dogs after rapid decompression to a near vacuum, to determine the effects of exposure. The formation of lamellar bodies is discussed, and it is shown that the absence of such bodies in control dogs which were perfused in an identical manner as the decompressed dogs indicated a correlation between the formation of lamellar bodies and the experimental conditions. Postdecompression recovery by the 67th day suggests that these intracellular changes are of little significance. B.H.

A69-39178 #
CHANGES IN ECG CONTOUR DURING PROLONGED $+G_z$ ACCELERATION.
George H. Cohen and William K. Brown (USAF, School of Aerospace Medicine, Brooks AFB, Tex.).
Aerospace Medicine, vol. 40, Aug. 1969, p. 874-879. 19 refs.

Critical analysis of the nature and mechanisms of the electrocardiographic changes occurring during gravitational stress. Eighteen test subjects were exposed to rapid onset profiles of 2.8, 3.1, and 3.3 g headward acceleration, with a 15 sec plateau and gradual onset run to a light peripheral loss. The subjects, ranging in age from 21 to 40 (mean 26), were instrumented with the standard bipolar leads I, II,

and III; the augmented unipolar leads AVR, AVL, and AVF; and the unipolar chest leads V-1 to V-6. The results show (1) an increase in the magnitude of the p wave in II, III, and AVF; (2) T wave flattening or inversion in II, III, AVF, and V 5 to V 6; (3) no change in cardiac rhythm other than sinus tachycardia; and (4) no disturbance of intraventricular or atrioventricular conduction. These findings support the premise that the p-wave changes are positional, while the T-wave changes are reflex-mediated and are an exaggerated version of the changes seen in orthostasis. B.H.

A69-39179
PATHOLOGY OF NORMOBARIC OXYGEN TOXICITY IN PRIMATES.
F. R. Robinson, R. L. Sopher, C. E. Witchett, and V. L. Carter, Jr. (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 40, Aug. 1969, p. 879-884. 24 refs.

Baboons, *Macaca irus* monkeys, and squirrel monkeys were exposed to 100 per cent oxygen at 720 mm Hg pressure for periods up to 14 days. Mortality occurred from days 4 through 13, with one each *M. irus* and squirrel monkey surviving the 14 days exposure. The last baboon died on the eighth day. The *M. irus* reacted similarly to *Macaca mulatta* that have been studied extensively; they went through the classical early exudative response which later resolved and was followed by the proliferative phase. The squirrel monkeys were remarkable in their apparent resistance to oxygen as measured by their pulmonary response which was considerably smaller than in the other species. The baboons were more susceptible to the acute disease than the *M. irus*. Blood-gas studies in all three species showed that during exposure they maintained arterial oxygen levels 3-5 times their normal concentrations, and dropped in baboons and *M. irus* only if the animal was near death. (Author)

A69-39180
PHYSICAL DEMANDS ON CABIN PERSONNEL IN CIVIL AVIATION.
Irma Åstrand and Åsa Kilbom (National Institute of Occupational Health, Stockholm, Sweden).
Aerospace Medicine, vol. 40, Aug. 1969, p. 885-890. 6 refs.

A cabin personnel sample of nine air hostesses, two pursers, and one steward, was studied with the object of analyzing the degree of strain imposed by their occupation. The studies were carried out by measuring the heart rate continuously (combined with simultaneous time studies) while the subjects performed their duties on journeys in both directions on the Stockholm-Amsterdam route and on the Stockholm-New York route. A medical examination was made, and the maximal aerobic power of the subjects was measured on the bicycle ergometer at the laboratory. A significant correlation was found between the maximal aerobic power per kilogram of body weight and the mean value for the heart rate while working on the journey. In other words, the individuals whose results revealed a low physical performance had a high heart rate while working, and vice versa. The highest values for heart rate were recorded during such common tasks as serving. (Author)

A69-39181
STATISTICAL DATA ON GROUNDING OF CREW MEMBERS IN AN AIRLINE DUE TO PSYCHIC DISORDERS.
J. Lavernhe, C. Blanc, and J. Pasquet (Compagnie Nationale Air France, Paris, France).
Aerospace Medicine, vol. 40, Aug. 1969, p. 894, 895. 10 refs.

Statistical study of psychic disorder leading to grounding in flight crews. The annual incidence of unfitness due to psychiatric disease is slight among highly qualified personnel, such as pilots (0.7 per thousand); in co-pilots it increases to 1.7 per thousand, in flight engineers to 2.2 per thousand, and in stewardesses to 5.2 per thousand. In 59 per cent of the cases, isolated neurotic syndromes were involved, and in 41 per cent somatic disabilities were aggravated by neurotic complications. Psychic disorders are second after cardiovascular diseases as causes of grounding. B.H.

A69-39182
TEMPERATURE HISTORY OF HARD SPACE SUIT DURING GLFC OPERATIONAL TEST.
Gerald R. Seemann, Charles A. Cullian, and Robert M. Rocco (Litton Industries, Inc., Beverly Hills, Calif.).
Aerospace Medicine, vol. 40, Aug. 1969, p. 898, 899.

Examination of the temperature history of a Litton Mark II hard space suit during an operational test simulating the procedures that an astronaut must follow in removing a fuel capsule assembly from a graphite lunar module fuel cask on the surface of the moon. A graph shows the temperature buildup and decline on the chest, the left hand, and the visor during four phases of action. B.H.

A69-39267 #
PSYCHOLOGICAL STUDY OF SMALL GROUPS OF SUBJECTS ISOLATED ON A HIGH MOUNTAIN (ETUDE PSYCHOLOGIQUE DE PETITS GROUPES DE SUJETS ISOLES EN HAUTE MONTAGNE).
Defayolle and Dietlin (Ministère des Armées, Service de Santé des Armées, Paris, France).
Revue des Corps de Santé des Armées, vol. 10, Apr. 1969, p. 169-181. 12 refs. In French.

Experimental investigation of life together by groups of four or five people isolated on a high mountain and subjected to adverse conditions. The results of the experiment showed that a quite thorough psychological selection of the subjects must be made in order to isolate groups of four or five people on a high mountain for an extended time. Another problem is the selection of the group leader, due to the fact that the adverse living conditions abolish the official hierarchy, leading to clashes between the group and its leader and to the emergence of an actual leader, in addition to the hierarchical leader. M.M.

A69-39268
ANALYSIS OF THE EFFICIENCY OF A GROUP OF RADAR OPERATORS ADAPTED TO NIGHT WORK IN A SERIES OF UNACCUSTOMED PSYCHOMOTOR TASKS ACCOMPLISHED AT NIGHT (ANALYSE DU RENDEMENT D'UN GROUPE D'OPERATEURS RADAR ADAPTES AU TRAVAIL NOCTURNE DANS UNE SERIE DE TACHES PSYCHOMOTRICES INHABITUELLES EFFECTUEES DE NUIT).
R. Angiboust, M. Gouars, and M. Guillermin.
Revue de Médecine Aéronautique et Spatiale, vol. 8, Mar. 1969, p. 5-7. 8 refs. In French.

Study of the effectiveness of human radar operators in the course of night work. The efficiency defects observed are, in general, considered to be related to a lowering of the vigilance level, as reported by Williams et al. (1959), Broadbent (1964), Bremond (1963), and Hartmann et al. (1965). The resolution of a task implies a method of working adapted to a logical learned process, and an optimum level of wakefulness. An attempt was made to find out if, in the course of night work, there existed a perturbation of the logic mechanism necessary for solution of the problem set. The only positive result obtained was observation of a slight lengthening of simple visual reaction time. F.R.L.

A69-39269
INQUIRY ON THE SLEEP HABITS OF A GROUP OF RADAR OPERATORS WORKING IN ALTERNATING CREWS (ENQUETE SUR LES HABITUDES DE SOMMEIL D'UN GROUPE D'OPERATEURS RADARISTES TRAVAILLANT EN EQUIPES ALTERNANTES).
P. Galban, M. Gouars, and M. Guillermin.

Revue de Médecine Aéronautique et Spatiale, vol. 8, Mar. 1969, p. 8-11. In French.

Study of the sleep habits and hours of sleep in a group of 73 radar operators working in alternate crews for a period of four weeks in a radar station on continuous watch. Night work (7 nights in 28 days) did not appear to cause a long-term sleep deficiency. Only a work week comprising three night watches, two of which were consecutive, showed a moderate sleep deficiency. Some subjects preferred to rise early, working in the morning; others preferred to work the evening watch, going to bed late. It appeared that the "morning subjects" slept more lightly than the "evening subjects." F.R.L.

A69-39270

ANALYSIS OF IN-FLIGHT ILLNESSES OBSERVED IN THE FRENCH AIR FORCE FROM 1961 TO 1967 (ANALYSE DES MALAISES EN VOL CONSTATES DANS L'ARMEE DE L'AIR FRANÇAISE DE 1961 A 1967).

P. Pesquies, M. Pingannaud, and J. Nathie.

Revue de Médecine Aéronautique et Spatiale, vol. 8, Mar. 1969, p. 13-18. 19 refs. In French.

Consideration of illness occurring in flight, defined as such when it is severe enough to interrupt the mission. Four main aspects of in-flight illness are examined: the etiology, the consequences with regard to the fitness of the person affected, the antecedents of the illness, and the long-term outcome. Emphasis is placed on psychological failures in the etiology of these illnesses. F.R.L.

A69-39271

INCIDENCE OF CARDIOVASCULAR ILLNESSES AMONG FLIGHT PERSONNEL OF AN AIRLINE (INCIDENCE DES MALADIES CARDIOVASCULAIRES PARMI LE PERSONNEL NAVIGANT TECHNIQUE D'UNE COMPAGNIE AERIENNE).

J. Lavernhe, J. Pasquet, and A. Mathivat (Compagnie Nationale Air France, Service Médical, Paris, France).

Revue de Médecine Aéronautique et Spatiale, vol. 8, Mar. 1969, p. 19-21. 9 refs. In French.

Discussion of the rising incidence of cardiovascular illness among aging aircrew members. Their average age is increasing throughout the world. The tracking down of coronary insufficiency in the interests of flight safety is a major preoccupation of doctors entrusted with periodic medical examinations. It is shown that cardiovascular risk rises abruptly, starting at age 45, and reaches nearly 15 per cent between 55 and 59 years. F.R.L.

A69-39272

MORPHOLOGICAL VARIATIONS OF THE ARTERIAL PULSE WAVE—EXPERIMENTAL AND CLINICAL CORRELATIONS (VARIATIONS MORPHOLOGIQUES DE L'ONDE PULSATILE ARTERIELLE—CORRELATIONS EXPERIMENTALES ET CLINIQUES).

C. Nogues, R. Carre, J. Kermarec, M. Pingannaud, and J. Pernod.

Revue de Médecine Aéronautique et Spatiale, vol. 8, Mar. 1969, p. 22-28. 7 refs. In French.

Discussion of the frequency of cardiac and arterial changes among young people as shown by the pulse, a subject of interest as a means of early detection of structural anomalies, and as a justification of experimental studies in this field. A hydraulic model is described, followed by a consideration of a recording of arterial pulse. Paraclinical recordings are also discussed. Morphological variations of the carotidogram appearing with age, arterial hypertension, and arteriosclerosis are compared with results obtained with the hydraulic model. F.R.L.

A69-39273

ANALYSIS OF BREATHABLE LIQUID OXYGEN—DETERMINATION OF ITS IMPURITIES (ANALYSE DE L'OXYGENE LIQUIDE RESPIRABLE—DOSAGE DE SES IMPURETES).

R. Falet, C. Bencemy, G. Denis, and J.-J. Villenave.

Revue de Médecine Aéronautique et Spatiale, vol. 8, Mar. 1969, p. 29-34. 15 refs. In French.

Examination of methods of analyzing the breathable oxygen used in aircraft, which must have a particularly high degree of purity. Determination of the purity, the percentage of water, and the proportions of carbon dioxide and methane is accomplished by chromatography with a flame ionization detector, effected directly on a portion of the gas. The other contaminants, organic or inorganic, are determined by gas phase chromatography after concentration by refrigeration. The results reported show that the specifications for breathable oxygen are ensured by the techniques described. F.R.L.

A69-39274

COMPARATIVE STUDY OF THE EFFECTS OF THREE HYPNOSIS-INDUCING AGENTS ON REACTION AND RESPONSE TIMES (ETUDE COMPARATIVE DE TROIS HYPNOGENES SUR LES TEMPS DE REACTION ET DE REPONSE).

Auffret, Seris (Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France), and M. Fatras.

Revue de Médecine Aéronautique et Spatiale, vol. 8, Mar. 1969, p. 35-40. In French.

Study of the effects of Mandrax, a medication which consists of methaqualone (which has a strong and rapid narcotic effect) and also contains dyphenydramine chlorohydrate, a strong antihistamine with sedative properties. Comparison was made with two other barbiturates, all three products being identified only by the code letters A, B, and C, using eight experimenters, who were tested for reaction time, response time, and tracking ability. Although Mandrax was found to have less perturbing effects than the other two barbiturates, all three are counterindicated for aircrews. F.R.L.

A69-39275

FATIGUE AND SLEEP LOSS IN AIRCREW.

T. C. D. Whiteside (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).

Revue de Médecine Aéronautique et Spatiale, vol. 8, Mar. 1969, p. 41-43.

Consideration of the ways in which sleep losses arise, and of the practical methods for combating such sleep loss. Lack of sleep arises primarily from two factors: transition through various time zones, and having to fly through normal sleeping times because of scheduling requirements. To combat these difficulties, experienced aircrew generally try to arrange their preflight sleep so that they wake up as near as possible to the takeoff time. Interest in the task, state of health, and motivation are important factors to be considered in the association between the amount of sleep and fatigue. F.R.L.

A69-39276

HEMORRHAGES OF THE DENTAL PULP OF THE RAT FOLLOWING ACUTE HYPOXIA (HEMORRAGIES DE LA PULPE DENTAIRE DU RAT CONSECUTIVES A DES HYPOXIES AIGUES).

A. M. Pfister, S. Despres (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Paris, France), R. Frank (Strasbourg, Université, Institut Dentaire, Strasbourg, France), and Y. Le Charpentier.

Revue de Médecine Aéronautique et Spatiale, vol. 8, Mar. 1969, p. 45-48. 12 refs. In French.

Results of histological observations made on rats subjected, in a decompression chamber, to abrupt variations of atmospheric pressure. Often a very marked congestion of the dental pulp blood vessels was observed, as well as hemorrhagic centers infiltrating the pulpy tissues from the radicular channels, and intravascular aeroembolisms,

especially in the roots. Congestive or hemorrhagic reactions were observed to a lesser degree in the dental pulp of rats subjected to 12-g accelerations for 10 min. Whether it is a question of a reduction of the oxygen partial pressure of the blood or a local ischemia (acceleration), there is a common factor—namely, tissue hypoxia.
F.R.L.

A69-39277
CONSIDERATIONS CONCERNING THE TREATMENT OF PARTIAL LOSS OF TEETH IN THE FIGHTER PILOT (CONSIDERATIONS SUR LE TRAITEMENT DE L'EDENTATION PARTIELLE CHEZ LE PILOTE DE CHASSE).
J. Dubruille (Paris, Université, Institut de Stomatologie, Paris, France), J. Vincent, and G. Bouhours (Ministère des Armées, Services de Santé, Paris, France).
Revue de Médecine Aéronautique et Spatiale, vol. 8, Mar. 1969, p. 49-51. 7 refs. In French.

Discussion of preventive and curative treatment of partial loss of teeth, which occurs frequently in fighter pilots. Appropriate preventive treatment can delay the date of appearance of tooth loss. When it occurs, use of dentures is indicated. Various suitable dentures are described.
F.R.L.

A69-39278
EFFECTS OF INHALATION OF AMYL NITRITE ON THE CAROTIDOGRAM OF A HEALTHY SUBJECT (ACTION DE L'INHALATION DE NITRITE D'AMYLE SUR LE CAROTIDOGRAMME DU SUJET SAIN).
J. Pernod, R. Carre, J. Kermarec, N. Vasile, and J. B. Hanin.
Revue de Médecine Aéronautique et Spatiale, vol. 8, Mar. 1969, p. 52-57. 34 refs. In French.

Study of the effects of amyl nitrite inhalation on the cardiovascular system. Results show the presence of tachycardia and a diminution in the isometric phase of contraction in the carotidograms of 100 healthy male subjects between the ages of 19 to 24.
B.H.

A69-39332
VISUAL MOTION PERCEPTION—EXPERIMENTAL MODIFICATION.
Richard H. Masland (McGill University, Dept. of Psychology, Montreal, Canada).
Science, vol. 165, Aug. 22, 1969, p. 819-821. 11 refs.

Demonstration of the existence of a long-term storage capability in vision. If a human observer fixates a moving spiral pattern for 15 minutes, a negative aftereffect of motion is perceived when he inspects a stationary spiral 20 hours later. The illusory motion is seen only when the stationary test stimulus falls upon the portion of the retina which had been stimulated by real motion. Thus previous stimulation can cause a relatively long-term modification of vision.
M.M.

A69-39440
PROCESSING BIOMEDICAL INFORMATION BY OPTICAL METHODS.
Wallace L. Anderson, L. S. Berger, R. W. Ware, and R. L. Bond (Southwest Research Institute, San Antonio, Tex.).
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, ANNUAL SOUTHWESTERN CONFERENCE AND EXHIBITION, 21ST, SAN ANTONIO, TEX., APRIL 23-25, 1969, RECORD. (A69-39437 21-07)
New York, Institute of Electrical and Electronics Engineers, Inc., 1969, p. 6 A 1-6 A 4.
NIH-supported research.

Investigation of the extent to which the well-known attributes of optical data processing systems can be utilized in the analysis of biomedical signals. The problem areas are outlined, and it is shown that they include (1) the conversion from electrical to optical format, and (2) the SNR considerations throughout the various steps involved in the procedure. Additional optical processing investigations include the development of a theory of filtering techniques taking into account special properties of certain common biomedical signals such as images of cell collections magnified by a microscope.
P.G.

A69-39441
PHYSIOLOGICAL RECORDING WITH DRY ELECTRODES.
Arthur E. Schulze, Travis C. Carr, and David M. Hickman (Space Craft, Inc., Biomedical Engineering Dept., Houston, Tex.).
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, ANNUAL SOUTHWESTERN CONFERENCE AND EXHIBITION, 21ST, SAN ANTONIO, TEX., APRIL 23-25, 1969, RECORD. (A69-39437 21-07)
New York, Institute of Electrical and Electronics Engineers, Inc., 1969, p. 6 B 1-6 B 8.

Description of techniques and instrumentation which have been developed for recording a clinical-quality electrocardiogram utilizing various types of dry electrodes. The design considerations and design requirements for both the preamplifier and the electrodes are given and should be chosen to fulfill the requirements of the application. The results of a material search in support of the development of insulated and conductive electrodes are given. Physiological recordings from several different dry electrodes are presented. The results of long-term recordings involving exercise and motion artifact studies demonstrate the feasibility of dry electrodes. The advantages of the use of dry electrodes for long-term aerospace monitoring, rapid attachment for emergency recording, recording under sterile conditions on burn patients, and rapid multiphasic screening are evident.
(Author)

A69-39442
QRS DISCRIMINATION FROM NOISY ELECTROCARDIOGRAMS.
Carl A. Braun (Tracor, Inc., Austin, Tex.), Carl W. Van Ryswyk (White Instruments, Inc., Austin, Tex.), and Fred B. Vogt (Texas, University, Austin, Tex.).
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, ANNUAL SOUTHWESTERN CONFERENCE AND EXHIBITION, 21ST, SAN ANTONIO, TEX., APRIL 23-25, 1969, RECORD. (A69-39437 21-07)
New York, Institute of Electrical and Electronics Engineers, Inc., 1969, p. 6 C 1-6 C 8. 6 refs.

Evaluation of the time error of detection of the QRS complex in noisy electrocardiograms by a discrimination method. Noise is added electronically to an essentially noise-free electrocardiogram which serves as a reference for the timing of events. Indication of reliability of detection is determined by observing the number of false detections and missed beats. The results indicate that the electrical activity of the heart may be detected visually under noise-free conditions with an accuracy of plus or minus 1 msec. With the addition of excessive noise, time variance on the order of 15 msec is observed.
B.H.

A69-39443
ELECTROCARDIOGRAM R-WAVE AMPLITUDE DETECTOR.
Bryan L. Steadman and Thomas W. Morris (USAF, School of Aerospace Medicine, Biomedical Engineering Branch, Brooks AFB, Tex.).
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, ANNUAL SOUTHWESTERN CONFERENCE AND EXHIBITION, 21ST, SAN ANTONIO, TEX., APRIL 23-25, 1969, RECORD. (A69-39437 21-07)
New York, Institute of Electrical and Electronics Engineers, Inc., 1969, p. 6 D 1-6 D 8.

Discussion of the design and evaluation of a device that produces a step-like output where the height of each step represents the amplitude of each R-wave of an electrocardiogram on a

beat-by-beat basis. An adjustable dc offset is available in the output stage of the device to facilitate the study of the beat-by-beat change in R-wave amplitude. The circuitry includes eleven operational amplifiers, two field-effect transistors and five diodes. The device is accurate to within one per cent of the average R-wave amplitude. (Author)

A69-39444
TWO ELECTRONIC STETHOSCOPES FOR USE IN HIGH NOISE LEVEL ENVIRONMENTS.
Homer L. Brammell, Maureen A. Hunt (USAF, Washington, D.C.), and James E. Allred.
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, ANNUAL SOUTHWESTERN CONFERENCE AND EXHIBITION, 21ST, SAN ANTONIO, TEX., APRIL 23-25, 1969, RECORD. (A69-39437 21-07)
New York, Institute of Electrical and Electronics Engineers, Inc., 1969, p. 6 E 1-6 E 6.

Description of two electronic stethoscopes designed to be used for litter and ambulatory patients on domestic and overseas air evacuation flights. Evaluation in high noise environments, including actual flight conditions, has demonstrated that these instruments are reliable and practical. It is concluded that these stethoscopes are useful in any noisy area where it is necessary to obtain heart sounds or indirect blood pressure measurements. (Author)

A69-39534 *
CARBOHYDRATE COMPONENTS OF UPPER CARBONIFEROUS PLANT FOSSILS FROM RADSTOCK, ENGLAND.
Frederick M. Swain, Judy M. Bratt, and Samuel Kirkwood (Minnesota, University, Minneapolis, Minn.).
Journal of Paleontology, vol. 43, Mar. 1969, p. 550-553. 5 refs.
Grant No. NGR-24-005-054.

Results of carbohydrate analyses of fossil plants from the Radstock Series of the Upper Coal Measures at Radstock, England. The specimens are carbonaceous residues in soft clay shale. The carbohydrate analyses show that monosaccharides, presumably of indigenous nature, can be separated from small amounts of fossil material. G.R.

A69-39535 *
AMINO ACID COMPONENTS OF SOME PALEOZOIC PLANT FOSSILS AND ROCK SAMPLES.
F. M. Swain and S. A. Kraemer (Minnesota, University, Minneapolis, Minn.).
Journal of Paleontology, vol. 43, Mar. 1969, p. 546-550. 21 refs.
Grant No. NGR-24-005-054.

Determination of the content of amino acid components in some Paleozoic plant fossils and rock samples, using regular analytical methods. Amino acid components such as glycine and serine, as well as glutamic acid, were found in the fossil plant samples. The Paleozoic rocks studied yield a surprisingly large variety of amino acids, including some with relatively low thermal and natural stability. Their presence demonstrates the mild thermal history of these rocks. Z.W.

A69-39606
COMPUTER ASSISTED INSTRUCTION IN THE DIAGNOSIS OF CARDIAC ARRHYTHMIAS.
E. J. Battersby (Vanderbilt University, School of Medicine, Nashville, Tenn.).
IN: AMERICAN FEDERATION OF INFORMATION PROCESSING SOCIETIES, SPRING JOINT COMPUTER CONFERENCE, BOSTON, MASS., MAY 14-16, 1969, PROCEEDINGS. VOLUME 34. (A69-39601 21-08)
Montvale, N.J., AFIPS Press, 1969, p. 703-708.
PHS Grant No. HEO-8195.

Description of a digital computer simulation of the events that determine cardiac rhythm, with the resultant activation of those portions of the heart that result in the generation of the clinical electrocardiogram. The operational logic includes simulation of the pacemakers allowing the heart to produce its own intrinsic repetition cycle. Attention is given to the specialized conducting tissue and its behavior in transmitting impulses. The important features of the simulation language used are enumerated, and the results are graphically illustrated. V.P.M.

A69-39617
EVIDENCE FOR EXTRATERRESTRIAL LIFE--IDENTITY OF SPOROPOLLENIN WITH THE INSOLUBLE ORGANIC MATTER PRESENT IN THE ORGUEIL AND MURRAY METEORITES AND ALSO IN SOME TERRESTRIAL MICROFOSSILS.
J. Brooks and G. Shaw (Bradford, University, School of Chemistry, Bradford, England).
Nature, vol. 223, Aug. 16, 1969, p. 754-756. 12 refs.

Results of experiments performed on the Orgueil and Murray meteorites which, it is believed, clearly establish that the insoluble matter in the meteorites is identical with sporopollenin. The results of examinations of the substances contained in the insoluble organic matter isolated from samples of the Orgueil and Murray meteorites show that they belong to the same class of polymeric material known as sporopollenins. These results are believed to be powerful evidence for the existence of extraterrestrial life. M.M.

A69-39627 #
INFLUENCE OF THE TRAINING OF NERVOUS PROCESSES ON THE BRAIN WEIGHT AND CHOLESTERASE ACTIVITY (VLIIANIE TRENIROVKI NERVNYKH PROTSESSOV NA VES MOZGA I AKTIVNOST' KHOLINESTERAZY).
G. A. Obrastsova, Z. D. Pigareva, and V. K. Fedorov (Akademiia Nauk SSSR, Institut Fiziologii; Akademiia Meditsinskikh Nauk SSSR, Institut Mozga, Moscow, USSR).
Akademiia Nauk SSSR, Doklady, vol. 186, June 21, 1969, p. 1449-1451. 9 refs. In Russian.

Study of changes in the brain weight and cholesterase activity in a total of 24 male rats, one- and three-months old, which developed defense reflexes after systematic exposures to acoustic and light stimuli of various types and intensity in a computer programmed device. A data dispersion analysis suggests that the average brain weight of the experimental rats was 2 per cent greater and that the acetyl and butyryl cholesterase activities in the white substance of their cerebra were lower than those in the control rats. V.Z.

A69-39630 #
DYNAMICS OF THE MOVEMENT OF AN ASTRONAUT TOWARD A SPACECRAFT WITH THE AID OF A TETHER, AND A PRINCIPLE OF SPACECRAFT CONTROL SYNTHESIS BASED ON THE THEORY OF SYSTEMS WITH A VARIABLE STRUCTURE (DINAMIKA PEREMESHCHENIIA KOSMONAVTA K KORABLIU S POMOSHCH'IU TROSA I PRINTSIP SINTEZA UPRAVLENIIA KORABLEM, OSNOVANYI NA TEORII SISTEM S PEREMENNOI STRUKTUROI).
V. N. Soshnikov and G. M. Ulanov (Akademiia Nauk SSSR, Institut Avtomatiki i Telemekhaniki, Moscow, USSR).
IN: GUIDANCE AND CONTROL IN SPACE; INTERNATIONAL FEDERATION OF AUTOMATIC CONTROL, CONGRESS, 4TH, WARSAW, POLAND, JUNE 16-21, 1969, PROCEEDINGS. (A69-39628 21-31)
Warsaw, Wydawnictwa Czasopism Technicznych NOT (Technical Session 49), 1969, p. 16-30. 7 refs. In Russian.

Discussion of the motion of an astronaut during reentry into a spacecraft with the aid of a flexible tether. Initial conditions allowing a smooth reentry with given constraints, so as to prevent spinning of the tether and astronaut-spacecraft collisions, are defined. A theoretical basis for spacecraft angular motion control during a

tether-controlled reentry process is derived. A mathematical model of this process is developed, assuming that both the astronaut and the spacecraft are solid bodies, that the tether is an unsteady link varying according to a linear law, and that external perturbations including those due to gravity field gradients are absent. The problems involved are solved for a plane motion of the system at constant rates of tether length reduction. V.Z.

A69-39701
INVESTIGATION OF SOME METHODS FOR INCREASING THE DIGESTIBILITY IN VITRO OF MICROALGAE.
Gudmund Hedenskog, Lennart Enebo (Royal Institute of Technology, Div. of Applied Biochemistry, Stockholm, Sweden), Jitka Vendlová, and Bohumír Prokeš (Czechoslovak Academy of Sciences, Institute of Microbiology, Dept. of Applied Algology, Třeboň, Czechoslovakia).
Biotechnology and Bioengineering, vol. 11, Jan. 1969, p. 37-51. 18 refs.

Investigation of mechanical, enzymatic, and chemical methods of degrading the cell wall structure of Scenedesmus algae in order to increase the availability of the cell bound protein in the algae. In ball-mill experiments a complete disintegration was achieved in a disintegrator, working with batches. After the ball-mill disintegration 95 per cent of the contaminating bacteria were killed, and yields of extractable proteins were higher. The capacity of available continuous ballmills is such that they could be used on a pilot-plant scale and the energy cost of disintegration would be of the same magnitude as that of separation. M.M.

A69-39708 #
INTERACTION IN BIOLOGICAL SYSTEMS (VZAIMODEISTVIE V BIOLOGICHESKIKH SISTEMAKH).
Iu. M. Vasil'ev, I. M. Gel'fand, Sh. A. Guberman, and M. L. Shik.
Priroda, no. 7, 1969, p. 24-33. 21 refs. In Russian.

Discussion of the interaction of cells in cell associations and of the correlation of individual motions required for the locomotion of animals. The physiological death of single cells as a necessary requirement for the survival of the collective cell system is considered. The restraints imposed on the rate of cell reproduction by the needs of the cell system are discussed. Differences between tumor cells and normal cells are examined. Experiments dealing with the coordination of leg movements in the locomotion of dogs and cats are described. Studies concerned with the determination of the parts of the brain which control locomotion are evaluated. G.R.

A69-39711
CURRENT STATUS OF MICROALGAE FROM WASTES.
William J. Oswald (California, University, Berkeley, Calif.).
(American Institute of Chemical Engineers, Engineering Foundation Research Conference, University of California, Santa Barbara, Calif., Aug. 7-11, 1967.)
Chemical Engineering Progress, Symposium Series, no. 93, 1969, p. 87-92. 9 refs.
NIH Grant No. WP 00026.

Discussion of water purification by removal of the oxidation products resulting from biological oxidation of organic wastes. The long-term effects of effluents containing biological oxidation products on the natural waters are assessed. Special attention is given to the method of controlled photosynthesis—i.e., controlled production of Chlorella or Scenedesmus algae on the wastes to be modified. The beneficial effects attainable through controlled photosynthesis are described. Methods of algae harvesting are examined, and the expenditures necessary for installation of controlled photosynthesis facilities are estimated. Z.W.

A69-39712
A NEW METHOD FOR OBTAINING PROTEIN ISOLATES FROM CHLORELLA ALGAE, TORULA YEASTS, AND OTHER MICROBIAL CELLS.
Hisateru Mitsuda, Kyoden Yasumoto, and Hisao Nakamura (Kyoto University, Kyoto, Japan).
(American Institute of Chemical Engineers, Engineering Foundation Research Conference, University of California, Santa Barbara, Calif., Aug. 7-11, 1967.)
Chemical Engineering Progress, Symposium Series, no. 93, 1969, p. 93-103. 29 refs.

Description of the urea-soaking method for extracting protein isolates from Chlorella algae, torula yeasts, and other microbial cells. The potential of microbial cells as food sources is discussed, and a survey of the microorganisms suitable as protein food sources is presented. The methods of protein extraction using the conventional extractants are briefly reviewed. Using the urea-soaking method, it might be possible to obtain easily digestible, highly acceptable, and nutritional microbial cells which could be used directly for human protein foods. The pretreatment, soaking step, and subsequent treatment of algae by this method are described. Composition of the protein isolates, their digestibility, and results of animal feeding tests are examined. Z.W.

A69-39783
AN EYE PROTECTIVE PANEL FOR FLASH-BLINDNESS PROTECTION USING TRIPLET STATE PHOTOCHROMISM.
William R. Dawson and Maurice Windsor (TRW Systems Group, Chemical Sciences Dept., Redondo Beach, Calif.).
Applied Optics, vol. 8, May 1969, p. 1045-1050. 10 refs.
USAF-supported research.

Description of a photochromic panel which has a viewing area of 15.0 by 20.0 cm and a thickness of 6.0 cm. It includes two photochromic plates of epoxy plastic containing four aromatic hydrocarbon compounds which are excited to their triplet states with two xenon flashlamps. The triplet absorption of the aromatic compounds results in a photochromic absorbance of 2.42 when the panel is activated with a 3000-J flash; 85 per cent of the final absorbance is achieved 150 microsec after the beginning of the flash. The transmission of the panel recovers to 37 per cent 5 sec after the panel darkens. The open-state transmission of the panel is 83 per cent. (Author)

A69-39792 #
SOME CONSIDERATIONS ON PILOT RATING.
Katsuyuki Miyajima.
Japan Society for Aeronautical and Space Sciences, Journal, vol. 17, Apr. 1969, p. 135-142. 11 refs. In Japanese, with abstract in English.

Analysis of the handling qualities of a second-order system in relation to pilot rating. Given the transfer functions of a pilot and a control system, the closed-loop characteristics of the second-order system are investigated, using the servomechanism theory. Theoretical predictions show good agreement with pilot rating. B.H.

A69-39864
COMPUTERIZED DISPLAY OF SPATIO-TEMPORAL EEG PATTERNS.
Thelma Estrin and Robert Uzgalis (California, University, Los Angeles, Calif.).
IEEE Transactions on Bio-Medical Engineering, vol. BME-16, July 1969, p. 192-196. 12 refs.
NSF Grant No. GP-6438.

Description of a new technique to compute and display the electroencephalogram as a spatiotemporal phenomenon. In this technique, position on a cathode ray tube is congruent with position in a recording array of electrodes on the head. The potential distribution over the area of the head covered by the array is computed and displayed as a contour map on the face of the tube.

Succeeding displays represent distributions at successive instants of time and are photographed by a motion-picture camera. The projected film recreates a time history of the potential field. Although this technique has been developed to investigate characteristic patterns of the electroencephalogram, it has application wherever it is necessary to investigate the time course of spatially distributed phenomena. (Author)

A69-39865
COMPUTING INVERSE SOLUTIONS FOR AN ON-OFF HEART MODEL.
R. C. Barr and T. C. Pilkington (Duke University, Div. of Biomedical Engineering and Div. of Pediatric Cardiology, Durham, N.C.).
IEEE Transactions on Bio-Medical Engineering, vol. BME-16, July 1969, p. 205-214. 10 refs.
NIH Grants No. HE-5716; No. HE-11307.

Consideration of ways of dealing with constrained dipole models of heart electrical activity. The models consist of multiple dipoles with fixed positions, and directions which have moments of one of two possible values—either some fixed (known) value, or else zero. First, for dealing with these models, an algorithm called the Disol procedure is presented. The Disol procedure provides a fast method for deciding which combination of on-off dipoles should be on to best fit a given set of surface potentials. Secondly, a method is presented for analyzing a given model to determine the effects of small variations in the geometric and surface potential data, independently of any particular set of surface potentials. Finally, such an analysis is performed on the data from one dog. (Author)

A69-39866 •
AN ALGORITHMIC APPROACH TO SIGNAL ESTIMATION USEFUL IN FETAL ELECTROCARDIOGRAPHY.
Jerome R. Cox, Jr. (Washington University, Dept. of Electrical Engineering, and Biomedical Computer Laboratory, St. Louis, Mo.) and Louis N. Medgyesi-Mitschang (McDonnell Douglas Corp., McDonnell Aircraft Co., Research Div., St. Louis, Mo.).
IEEE Transactions on Bio-Medical Engineering, vol. BME-16, July 1969, p. 215-219. 7 refs.
NASA-supported research; NIH Grant No. FR-00161.

Formulation of the nonlinear signal estimation problem in terms of algorithms suitable for machine implementation. The signals of the class considered in the estimation process have short time durations and are randomly delayed within the observation interval. A subclass of such a set of signals is formed by the P-QRS complexes in fetal electrocardiography. The algorithmic approach presented avoids the usual analytical difficulties encountered in nonlinear signal estimation. The results for the estimates obtained via the algorithms presented are quite general and readily understandable. (Author)

A69-39871 *
SENSITIVITY OF THE ADRENAL CORTICOSTERONE RESPONSE TO ACTH AS A FUNCTION OF TIME AFTER HYPOPHYSECTOMY.
Joan Vernikos-Danellis (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.).
Endocrinology, vol. 84, June 1969, p. 1507, 1508. 5 refs.

Comparison of the sensitivity of the increase in adrenal corticosterone concentration in rats in response to ACTH at various time intervals after removal of the pituitary gland. The animals were most sensitive 2 and 4 hr after removal of the pituitary, and the sensitivity of this response decreased progressively at intervals of 12 hr or longer after hypophysectomy. (Author)

A69-39906
BIOMAGNETIC LEVITATION AND RELATIVISTIC SPACE FLIGHT.
Friedwardt Winterberg (Nevada, University, Desert Research Institute, Laboratory for Space Research, Las Vegas, Nev.).
Raumfahrtforschung, vol. 13, July-Aug. 1969, p. 164-169.

Demonstration that the limitations of manned relativistic space flight can be considerably increased by levitating the human body in a strong inhomogeneous magnetic field to compensate the inertial forces on the human body during acceleration levels larger than 1 g or 1000 cm/sq sec. However, since a perfect biomagnetic levitation is impossible, there is an upper limit for the acceleration on the order of 10 g or approximately 10,000 cm/sq sec. Perfect biomagnetic levitation is not possible for two reasons: first, the magnetic susceptibilities for different organic components of the human body are not exactly equal, and second, it is impossible to obtain a magnetic body force that has the same value everywhere. However, the required high magnetic fields rule out biomagnetic levitation in the forseeable future even for nonrelativistic nuclear rockets. Only if the still hypothetical matter-antimatter rocket becomes feasible at some time in the future, will it be possible to produce the required high magnetic fields. (Author)

A69-39940
INFLUENCE OF STATURE AND PHYSICAL FITNESS ON TILT-TABLE AND ACCELERATION TOLERANCE.
K. E. Klein, H. Brüner, D. Jovy, L. Vogt, and H. M. Wegmann (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).
(International Congress on Aviation and Space Medicine, 17th, Oslo, Norway, Aug. 5-8, 1968.)
Aerospace Medicine, vol. 40, Mar. 1969, p. 293-297. 25 refs.
(DVL-898)

A comparison of 12 healthy, but physically untrained, students with 12 highly trained athletes proved significant differences for the maximal working capacity (maximum oxygen uptake). The heart rate level of athletes was about 22 per cent lower at rest and during a 90 deg tilt of 20-min duration. However, orthostatic tolerance and the responses of blood and pulse pressure to tilt were almost identical in both groups. The same was true for acceleration tolerance (the central light loss during acceleration). (Author)

A69-40049 * #
THE FACILE ISOLATION OF A STRUCTURAL PHOSPHOLIPOPROTEIN FROM HYDROGENOMONAS FACILIS AND NEUROSPORA CRASSA.
Glenn D. Kuehn, Bruce A. McFadden, Roy A. Johanson, John M. Hill, and Lewis K. Shumway (Washington State University, Dept. of Chemistry and Dept. of Botany, Pullman, Wash.).
National Academy of Sciences, Proceedings, vol. 62, Feb. 1969, p. 407-414. 31 refs.
Research supported by Washington State University; NIH Grant No. GM-09039; Grant No. NGR-48-001-004.

Description of a new and gentle procedure for isolating "structural" phospholipoproteins from organisms. The first such isolation from a procaryotic microbe, Hydrogenomonas facilis, is reported. The amino acid composition of its protein moiety resembles that of "structural protein" from other sources. Although disk gel electrophoresis has shown the protein to be heterogeneous, this is attributed to aggregation. (Author)

A69-40051 * #
STIMULATION OF C^{14}-MELATONIN SYNTHESIS FROM C^{14}-TRYPTOPHAN BY NORADRENALINE IN RAT PINEAL IN ORGAN CULTURE.
Julius Axelrod (U.S. Public Health Service, National Institute of Mental Health, Laboratory of Clinical Science), Harvey M. Shein (McLean Hospital, Research Laboratories, Belmont; Harvard University, Harvard Medical School, Dept. of Psychiatry, Boston, Mass.), and Richard J. Wurtman (Massachusetts Institute of

Technology, Dept. of Nutrition and Food Science, Cambridge, Mass.).
National Academy of Sciences, Proceedings, vol. 62, Feb. 1969, p. 544-549. 14 refs.
NIH Grants No. NB-06610; No. AM-11709; No. AM-11237; Grant No. NGR-22-009-272.

Discussion of the significance of tests which show that the sympathetic nerve transmitter, noradrenaline, increases the synthesis of melatonin by pineal glands maintained in organ culture. It was found that noradrenaline stimulates the synthesis of C^{14}-melatonin from C^{14}-tryptophan. Other compounds related in structure to noradrenaline increase melatonin and serotonin synthesis. It is concluded that noradrenaline liberated from sympathetic nerves stimulates the formation of melatonin either by increasing the formation of new melatonin-forming enzyme, by increasing transport of tryptophan into the pineal cell, or by inhibiting the metabolism of serotonin by the alternate deaminating pathway. G.R.

A69-40054 * #
INCORPORATION OF ^{14}C-TRYPTOPHAN INTO ^{14}C-PROTEIN BY CULTURED RAT PINEALS—STIMULATION BY l-NOREPINEPHRINE.
Richard J. Wurtman (Massachusetts Institute of Technology, Dept. of Nutrition and Food Science, Cambridge, Mass.), Harvey M. Shein (McLean Hospital, Research Laboratory), Julius Axelrod (Harvard University, Harvard Medical School, Dept. of Psychiatry, Boston, Mass.), and Frances Laren (National Institutes of Health, National Institute of Mental Health, Laboratory of Clinical Science, Bethesda, Md.).
National Academy of Sciences, Proceedings, vol. 62, Mar. 15, 1969, p. 749-755. 17 refs.
NIH Grants No. AM-11709; No. NB-06610; Grant No. NGR-22-009-272.

Demonstration that cultured rat pineals incorporate ^{14}C-tryptophan into new proteins, and that the rate at which the ^{14}C-proteins are formed is increased by the addition of norepinephrine. The finding that norepinephrine, but not serotonin, can stimulate the incorporation of ^{14}C-tryptophan into pineal proteins is consistent with the hypothesis that norepinephrine is the neurotransmitter substance utilized by pineal sympathetic nerve endings. F.R.L.

A69-40055 • #
OLFACTORY BULB REMOVAL—EFFECTS ON BRAIN NOREPINEPHRINE.
Larissa A. Pohorecky, Michael J. Zigmond, Lennart Heimer, and Richard J. Wurtman (Massachusetts Institute of Technology, Dept. of Nutrition and Food Science and Dept. of Psychology, Cambridge, Mass.).
National Academy of Sciences, Proceedings, vol. 62, Apr. 1969, p. 1052-1055. 21 refs.
NIH Grants No. AM-11237; No. AM-11709; No. NB-06542; Grant No. NGR-22-009-272.

Study of the mechanism by which the removal or transection of the olfactory bulb in rats decreases telencephalic norepinephrine. The effect of this lesion on the ability of the telencephalon to take up and retain the norepinephrine placed in the lateral cerebral ventricles is examined. It is suggested that the method described can be used as a technique for mapping central adrenergic pathways. Z.W.

A69-40057 #
X-RAY ANALYSIS OF RETINAL PHOTORECEPTORS.
W. J. Gras and C. R. Worthington (Michigan, University, Dept. of Physics and Biophysics Research Div., Ann Arbor, Mich.).
National Academy of Sciences, Proceedings, vol. 63, June 15, 1969, p. 233-238. 10 refs.
NIH Grant No. GM-09796.

Low-angle X-ray reflections have been recorded from photoreceptors in four types of intact untreated retinae. The retinae were maintained in a living condition during the X-ray exposure. The X-ray reflections arise from the regular arrangement of disk membranes within the photoreceptors. The recorded X-ray intensities contain information on the one-dimensional electron-density distribution of the photoreceptors. An electron-density model which is in good agreement with the low-angle X-ray data has been derived. (Author)

A69-40058 #
A NEW PRINCIPLE FOR ELECTROMAGNETIC CATHETER FLOW METERS.
Alexander Kolin (California, University, School of Medicine, Dept. of Biophysics, Los Angeles, Calif.).
National Academy of Sciences, Proceedings, vol. 63, June 1969, p. 357-363. 12 refs.
Research supported by the University of California; PHS Grant No. GRSG 1 SOL FR 05354; Contract No. Nonr-233(64).

Description of an electromagnetic catheter flowmeter in which the magnetic field is generated by two parallel bundles of wire carrying equal currents in opposite directions. The electrodes are fixed centrally to the insulated wire bundles that generate the magnetic field. The flow sensor is flexible, resembling a split catheter. The flow transducer is designed to constrict as it is introduced through a branch artery and to expand in the main artery over the span of its diameter. The principle is suitable for branch flow measurement, as well as for measurement of flow in a major artery or vein by the same transducer. A special method of guiding the electrode wires results in a zero base line at zero flow for the entire range of diameters accommodating the field-generating coil. The electrodes could be used in this configuration with a magnetic field generated by coils external to the patient for blood flow measurements with a catheter of reduced gauge. The transducer can be made smaller in circumference than those employed in other electromagnetic flow-measuring catheter devices. This feature is of special value for envisaged clinical uses to minimize surgical intervention. M.M.

A69-40060 *
NON-DARWINIAN EVOLUTION.
Jack Lester King and Thomas H. Jukes (California, University, Berkeley, Calif.).
Science, vol. 164, May 16, 1969, p. 788-798. 54 refs.
AEC-supported research; Grant No. NGR-05-003-020.

Investigation of the possibility of a non-Darwinian process. Fixation of selectively neutral isoalleles and mutations to synonymous codons are discussed. Evolution in protein and in desoxyribose nucleic acid is compared. The Treffers mutator gene and the evolution of proteins are considered. The apparently neutral mutations in Escherichia coli are mentioned, and the rates of amino acid substitution are observed. The question of the selectively neutral proportion of all mutations is raised, and allele selection through Darwinian evolution is studied. Expectations for models of Darwinian and non-Darwinian evolution are compared with regard to changes of proteins, and amino acid composition. The comparative rarity of arginine is noted. On the basis of these considerations, it is concluded that most evolutionary change in proteins may be due to neutral mutations and genetic drift. P.G.

A69-40104
MICROWAVE HAZARDS EVALUATION—CONCEPTS AND CRITERIA.
Sol M. Michaelson (Rochester, University, School of Medicine and Dentistry, Dept. of Radiation Biology and Biophysics, Rochester, N.Y.).
(International Microwave Power Institute, Symposium, Edmonton, Canada, May 21-23, 1969, Paper DA 6.)

Journal of Microwave Power, vol. 4, June 1969, p. 114-119. 15 refs. AEC-supported research.

Discussion of basic guidelines for evaluating data on microwave hazards obtained on experimental animals and from surveys on humans. The nonthermal effects of microwaves are considered, and comments on Soviet views are made. From the accumulated experimental data, it becomes clear that each animal species differs in terms of its relative sensitivity to microwave radiation. Although data from animal experiments provide useful guidelines, extrapolation to man must be done with extreme caution. The question of possible genetic and neurological effects from low-level microwave exposure, and the resolution of the controversy concerning thermal, nonthermal, and microthermal effects are extremely important in the development of a realistic maximum permissible exposure. M.M.

A69-40158

DYNAMIC ASPECTS OF THE HUMAN ELECTROENCEPHALOGRAM—INITIAL RESULTS OF A RADIOTELEMETRIC STUDY (*ASPECTS DYNAMIQUES DE L'ELECTROENCEPHALOGRAMME HUMAIN—PREMIERS RESULTATS D'UNE ETUDE RADIO-TELEMETRIQUE*).

G. Arfel, C. Casanova, and M. Coulmance (Institut National de la Santé et de la Recherche Médicale, Unité de Neurophysiologie Chirurgicale, Suresnes, Hauts-de-Seine, France).

Electroencephalography and Clinical Neurophysiology, vol. 27, Sept. 1969, p. 225-237. 23 refs. In French.

Investigation of the possible variations of the human EEG recorded by radiotelemetry. It is noted that the subjects examined were not selected according to clinical criteria but according to purely EEG criteria derived from a previous conventional EEG (frequency, distribution, and reactivity of the components, occurrence of unusual waveforms such as spikes, spikes and waves, paroxysmal bursts of slow waves, etc.). A simple experimental protocol formed the basis of these examinations, the average duration of which was 3 hr. No attempt at diagnosis is made, and only the dynamic behavior of the cerebral rhythms is considered. Their variation during various tests is reported to be relatively limited, with special features in some of them (puzzles, listening to music). It is shown that the dynamics of the open-eye alpha rhythm manifest themselves in various modes (occipital, "propagated," bursts of "alpha release"). The occurrence of unusual waveforms did not seem to be specially favored by the chosen experimental procedure, but some examples of "facilitation" of these waveforms are reported. P.G.

A69-40159

CHANGES INDUCED IN STABILIZED IMAGE VISIBILITY BY EXPERIMENTAL ALTERATION OF THE ONGOING EEG.

Ulker Tulunay Keesey and Dennis J. Nichols (Wisconsin, University, Medical School and Laboratory Computer Facility, Madison, Wis.).

Electroencephalography and Clinical Neurophysiology, vol. 27, Sept. 1969, p. 248-257. 25 refs.

Research supported by the University of Wisconsin; NIH Grant No. NB-06151.

Determination of the possibility of controlling the time at which disappearance or reappearance of an image occurs by inducing changes in the probability of alpha occurrence normally found under stabilized viewing conditions. Continuous EEG recordings were taken while judgments of stabilized image disappearance and reappearance were being made. On-line use of a computer executing a closed-loop program made it possible to detect the alpha rhythm while it was occurring and to present a burst of white noise shortly after each onset of alpha activity. The stimulus could also be presented in random order. It was found that alpha-dependent presentation of the stimulus both lengthened the time the stabilized image stayed visible and changed the temporal patterns of alpha occurrence and image disappearance and reappearance in comparison with the case where the stabilized image was viewed without any white noise presentation. P.G.

A69-40160

CHANGES IN CORTICAL AND THALAMIC EVOKED ACTIVITIES DURING SENSORY CONDITIONING. I, II (MODIFICATIONS DES ACTIVITES EVOQUEES CORTICALES ET THALAMIQUES AU COURS D'UN CONDITIONNEMENT SENSORIEL. I, II).

G. Lelord (Paris, Université, Laboratoire de Physiologie des Centres Nerveux; Centre National de la Recherche Scientifique, Paris, France) and C. Maho (Paris, Université, Laboratoire de Physiologie des Centres Nerveux, Paris, France).

Electroencephalography and Clinical Neurophysiology, vol. 27, Sept. 1969, p. 258-279. 69 refs. In French.

Study of modifications of evoked responses in a freely moving cat during sensory conditioning. In these experiments a brief tone was used as the conditioned stimulus, while a brief stimulation of weak intensity to the cutaneous branch of the radial nerve was used as the unconditioned stimulus. Preferential zones for conditioned changes are defined which, it is hoped, may assist in understanding the main features of electrophysiological conditioning. The early appearance of cortical response confirms the classical theories, but at a later stage the thalamic changes probably reflect the activation of a subcortical short-circuit which seems to figure in the consolidation of conditioning. Contrary to generally accepted notions, it appears that in these experiments temporal linking of stimuli leads to a particular case of time-dependent conditioning, whereas the temporal independence of stimuli corresponds more closely to the conditions of a more general acquisition. P.G.

A69-40161

FUNCTIONAL CHANGES OF SOMATO-SENSORY SYSTEM DURING DEEP SLEEP.

Cesare Casati, Nicola Dagnino, Emilio Favale, Mario Manfredi, Andrea Seitun, and Antonio Tartaglione (Genova, Università, Clinica delle Malattie Nervose e Mentali, Genoa; Sassari, Università, Clinica delle Malattie Nervose e Mentali, Sassari, Italy).

Electroencephalography and Clinical Neurophysiology, vol. 27, Sept. 1969, p. 289-295. 13 refs.

Investigation of the function level of the somatosensory pathway from periphery to cortex with the aid of the evoked potential technique during rapid eye movement (REM) and non-REM periods of deep sleep. The occurrence of REMs is usually associated with an increased effectiveness of afferent volleys, as a greater amount of the cortical cell population is activated during REM periods. This change is due either to a phasic enhancement of transmission through the ventroposterolateral nucleus of the thalamus or to increased cortical responsiveness. It is noted, however, that cortical responsiveness to a fixed input does not show constant modifications during REM with respect to non-REM periods. P.G.

A69-40162

THE INFLUENCE OF END-TIDAL CARBON DIOXIDE TENSION ON EEG CHANGES DURING ROUTINE HYPERVENTILATION IN DIFFERENT AGE GROUPS.

C. D. Binnie, P. A. Coles, and J. H. Margerison (St. Bartholomew's Hospital, Dept. of Clinical Neurophysiology, London, England).

Electroencephalography and Clinical Neurophysiology, vol. 27, Sept. 1969, p. 304-306. 7 refs.

Investigation of the effect of age and of change of carbon dioxide tension upon the EEG responses in adolescents and in adults. In 24 patients aged from 12 to 50 years a significant positive association was found between the change in end-tidal carbon dioxide tension during 3 min overbreathing and the development of slow activity. A significant negative correlation between age and the amount of change in the EEG was observed. It is tentatively suggested that in adolescents and adults the apparent influence of age upon EEG responses to overbreathing may be secondary to a decline in ventilatory performance with increasing years. P.G.

A69-40163 *
DISCRIMINANT ANALYSIS IN AVERAGE EVOKED RESPONSE STUDIES—THE STUDY OF SINGLE TRIAL DATA.
Emanuel Donchin (NASA, Ames Research Center, Moffett Field, Calif.).
Electroencephalography and Clinical Neurophysiology, vol. 27, Sept. 1969, p. 311-314. 8 refs.

Approach to the measurement of the similarity of an EEG segment following the onset of a specific stimulus to a given average evoked potential. The data obtained suggest that it is possible to make meaningful comparisons between EEG records obtained with a single presentation of the stimulus and the average evoked potential. The technique for measuring evoked response similarity assumes that each record represents a point in a multidimensional space, and similarity is defined as the Euclidean distance in this space. P.G.

A69-40198 #
ONTOGENESIS AND HORMONAL CONTROL OF CIRCADIAN RHYTHMS (ZUR ONTOGENESE UND HORMONELLEN STEUERUNG CIRCADIANER RHYTHMEN).
Ludger Rensing.
Göttingen, Akademie der Wissenschaften, Nachrichten, Mathematisch-physikalische Klasse, no. 8, 1969, p. 57-70. 57 refs. In German.

Study of phase shifts of the circadian rhythm with regard to light variations. It is shown that the phase of the circadian rhythm and the hormone concentrations change in the course of ontogenesis, and that the intensity, wavelength, and duration of light influence the phase and frequency of the circadian rhythm as well as the hormone concentrations. Experimentally induced changes of hormone concentration by hormonal gland removal, hormone addition, or by stress, shift the phase of the circadian rhythm. It is noted that the effects of light and hormones on cellular processes are similar to some extent. It is concluded that in the case of organisms with light-impenetrable integuments hormones control and synchronize cellular circadian rhythms, if direct control by light is excluded. P.G.

A69-40199
RELATIONS BETWEEN PHYSICAL TRAINING, ACCLIMATIZATION, AND HEAT TOLERANCE.
Carl Gisolfi and Sid Robinson (Indiana University, Dept. of Anatomy and Physiology, Bloomington, Ind.).
Journal of Applied Physiology, vol. 26, May 1969, p. 530-534. 13 refs.
Contract No. DA-49-193-MD-2449.

Study designed to determine the effects of strenuous physical training on men's tolerance for work in heat. Five healthy, untrained young men, wearing only shorts, shoes, and socks, attempted a 90-min walk (average time 86 min) on a treadmill in heat (50 deg C dry bulb, 27 deg C wet bulb). After this heat tolerance test the men performed six weeks of intensive interval training in T-shirt, shorts, shoes, and socks on an indoor track, alternating with strenuous handball or basketball games 1 hr daily 5 times per week in a cool environment (21 deg C). The workouts raised the men's rectal temperatures markedly (38.4 to 39.7 deg C) and elicited pronounced sweating (0.47 to 1.44 kg). The training period was followed by a second work-heat exposure, in which all men completed the 90 min and had none of the symptoms of syncope shown by the majority in the initial exposure. Rectal and mean skin temperatures averaged 39.6 and 37.8 deg C, and heart rates averaged 168 beats/min at the end of the initial exposure; corresponding mean values for the posttraining heat tests were 38.7 deg C, 36.8 deg C, and 144 beats/min. Mean sweat rate per degree increase in rectal temperature above 37 deg C increased 50 per cent. Interval training indoors improved the heat tolerance of the men significantly, but did not fully acclimatize them for work in the heat. (Author)

A69-40200
MECHANICAL COMPONENTS OF HUMAN EYE MOVEMENTS.
D. A. Robinson, D. M. O'Meara, A. B. Scott, and C. C. Collins (Smith-Kettlewell Institute for Visual Sciences, Pacific Medical Center, San Francisco, Calif.; Johns Hopkins University, School of Medicine, Dept. of Medicine, Baltimore, Md.).
Journal of Applied Physiology, vol. 26, May 1969, p. 548-553. 26 refs.
PHS Grants No. AM-05524; No. NB-06038; No. 5 SOL FR-05566; Contract No. Nonr-3009(00).

Measurement of the isometric tensions of three lateral rectus muscles of three patients while detached from the globe during strabismus surgery together with the force required to rotate the globe horizontally with both horizontal recti detached. The length-tension relationship was measured for several levels of innervation by requesting the patient to make known eye movements with the unoperated eye. Muscle tone in the primary position of gaze ranged from 12 to 17 g. The slope of the length-tension curve near the primary position was about 0.45 g/deg. The spring constant of the passive muscle components was about 0.25 and 0.33 g/deg for the globe suspensory tissues. This makes it possible to estimate the division of forces between agonist, antagonist, and suspensory tissues for any angle of gaze. The time course of isometric tension associated with saccades clearly reveals the pulsatile nature of net active state tension that accounts for the rapidity of saccadic eye movements. (Author)

A69-40201 *
CIRCADIAN VARIATIONS IN HUMAN THERMOREGULATORY RESPONSES.
Robert El. Smith (Kentucky, University, Dept. of Physiology and Biophysics, Lexington, Ky.).
Journal of Applied Physiology, vol. 26, May 1969, p. 554-560. 25 refs.
Grant No. NGR-18-001-008; Contract No. AF 41(609)-2684.

Investigation of circadian variations in human temperature regulation, in which peripheral and rectal temperatures and peripheral heat and arterial blood flows were measured in clothed resting males in a neutral environment at different times throughout the day. Core-periphery heat conductance was considered a measure of thermoregulatory function and was used, together with peripheral heat and blood flows, in evaluating changes in this function. Circadian thermoregulatory changes were isolated from responses to environmental stresses variously by bed-rest procedures, by use of conventional statistics, and by periodicity analysis following Halberg's Cosinor method. The results thus obtained indicate that circadian changes do occur in all thermoregulatory functions measured and that a possible mechanism for these variations may be a circadian change in circulatory pathways, and thus in counter-current heat exchange, as well as a circadian variation in peripheral blood supply. (Author)

A69-40202 #
INSTANTANEOUS PERIPHERAL VASCULAR RESISTANCE CHANGES RENDERED BY CRITICAL CLOSING PHENOMENON.
Robert M. Olson (USAF, School of Aerospace Medicine, Aerospace Medical Div., Biodynamics Branch, Brooks AFB, Tex.).
Journal of Applied Physiology, vol. 26, May 1969, p. 600-605. 6 refs.

Use of the gracilis muscle of five anesthetized dogs to study the critical closing phenomenon. Pressure-flow (i.e., resistance) measurements and tissue-staining techniques were used to detect the sudden closure of vessels in the microcirculation as the pressure driving blood through them was gradually decreased. Sudden rises in resistance occurred as the pressure fell through several discrete levels, one of which was near diastolic pressure. The tissue-staining technique suggested that sudden resistance rises are probably associated with sudden decreases in the number of functioning microcirculatory beds in the muscle tissue. Other investigators have reported a sudden rise in resistance (to infinity) associated with a

shutdown of flow through all microcirculatory beds as pressure falls to a level near 10 to 20 cm H_2O due to the critical closing phenomenon. The findings of the present study suggest that the critical closing phenomenon occurs not just at low pressures, but also at pressures near the normal physiological range. (Author)

A69-40203
BLOOD OXYGEN CONTENT MEASURED BY OXYGEN TENSION AFTER RELEASE BY CARBON MONOXIDE.
C. Herman Klingenmaier, Marjam G. Behar, and Theodore C. Smith (Pennsylvania, University, School of Medicine, Dept. of Anesthesia, Philadelphia, Pa.).
Journal of Applied Physiology, vol. 26, May 1969, p. 653-655. 7 refs.
PHS Grants No. GM-09070-06; No. GM-15430-02.

Demonstration that whole-blood oxygen content can be measured by the increase in dissolved oxygen tension when an accurately known volume of blood is diluted to another accurately known volume with deoxygenated, carbon monoxide-saturated, physiological saline. The CO displaces O_2 from hemoglobin without lysing the cells, raising the partial pressure of oxygen in the mixture by an amount proportional to the content of oxygen. CO-saline is stable and hence superior to other oxygen-releasing solutions. A five-port two-bore stopcock and a volume-limited syringe facilitate the sample preparation. The results are very reproducible and directly related to Van Slyke analyses, although a small systematic difference exists. (Author)

A69-40204
A DEVICE TO TEST MECHANICAL PROPERTIES OF TISSUES AND TRANSDUCERS.
William K. Tucker, Joseph S. Janicki, Fred Plowman, and Dali J. Patel (National Institutes of Health, National Heart Institute, Cardiology Branch, Bethesda, Md.).
Journal of Applied Physiology, vol. 26, May 1969, p. 656-658. 10 refs.

Description of a device designed to determine the dynamic mechanical properties of tissues and various transducers. Elastic properties of polyurethane, Hevea rubber, and descending thoracic aorta were evaluated using this device. Results agreed within 6 per cent with those obtained independently using other methods. (Author)

A69-40205
CONTRIBUTION OF COMPLIANCE OF AIRWAYS TO FREQUENCY-DEPENDENT BEHAVIOR OF LUNGS.
Jere Mead (Harvard University, Harvard School of Public Health, Dept. of Physiology, Boston, Mass.).
Journal of Applied Physiology, vol. 26, May 1969, p. 670-673. 5 refs.
PHS Grant No. GM-12564.

Study of the effect of airway distensibility on the overall elastic behavior of lungs in man. The predicted compliance and resistance at different breathing frequencies are shown (1) for normal lungs, (2) for a lung with increased peripheral airway resistance, (3) for a lung with increased peripheral resistance and increased compliance, and (4) for a lung with values for compliance and resistance corresponding to ones in chronic obstructive lung disease. It is concluded that the frequency-dependent behavior of diseased lungs could reflect differences in distribution of tidal volume between the airways and the pulmonary parenchyma. Z.W.

A69-40206
PLASMA HISTAMINE LEVELS AND CARDIOVASCULAR EFFECTS AFTER COMPOUND 48/80.
Richard E. Brashear, Joseph C. Ross, and R. Russell Martin (Indiana University, Medical Center, Dept. of Medicine, Indianapolis, Ind.).
Journal of Applied Physiology, vol. 27, Aug. 1969, p. 170-173. 36 refs.
PHS Grants No. FR-00162; No. HE-06228; No. HE-04080; No. HE-06308; No. AI-00343-02; No. AI-07902-02; Contract No. AF 33(615)-2922.

Measurement of arterial blood gas tensions and plasma histamine, cardiac output, central blood volume, and pressures in the aorta, left ventricle, and pulmonary artery in dogs before and 5, 10, 15, and 30 min after administration of compound 48/80 (a potent histamine liberator), 0.15 mg/kg intravenous. There was a significant decrease in aortic and pulmonary artery pressures, end-diastolic pressure in the left ventricle, cardiac output, central blood volume, stroke volume, heart rate, alveolar oxygen partial pressure, and oxygen saturation and a significant increase in plasma histamine during the 30 min after compound 48/80 was given. Pulmonary and systemic vascular resistances were increased only at the 5-min period. Starting 10 min after compound 48/80 injection, there was a progressive decrease in arterial pH, and after 30 min there was a marked acidosis with a large increase in arterial lactate compared to pyruvate. Compound 48/80 produces shock and acidosis with elevated histamine levels in the dog. (Author)

A69-40207
VENTILATORY RESPONSE TO A SINGLE BREATH OF CO_2 IN O_2 IN NORMAL MAN AT SEA LEVEL AND HIGH ALTITUDE.
Søren C. Sørensen(California, University, Medical Center, Cardiovascular Research Institute, San Francisco, Calif.) and Julio C. Cruz (Universidad Peruana, Lima, Peru).
Journal of Applied Physiology, vol. 27, Aug. 1969, p. 186-190. 23 refs.
NIH Grant No. HE-06285.

Study undertaken to examine the sensitivity of the peripheral chemoreceptors to carbon dioxide in the same groups of individuals. The ventilatory response to a single large breath of carbon dioxide in oxygen was tested, using several concentrations of carbon dioxide in oxygen. The ventilatory response was correlated with the alveolar carbon dioxide partial pressure, and a "peripheral chemoreceptor carbon dioxide response curve" could be constructed. Sea-level and high-altitude natives were examined both at sea level and at high altitude. The slope of the peripheral chemoreceptor carbon dioxide response curve was higher in sea-level than in high-altitude natives at both altitudes, but the slope was also higher at altitude than at sea level in both groups. The limitations of the method are discussed, and it is concluded that the varied response in the two groups does not provide any definite information about the anatomical site of the difference in hypoxic sensitivity between the groups. (Author)

A69-40208 •
STATIC PROPERTIES OF LUNGS AFTER OXYGEN EXPOSURE.
Edward J. Burger, Jr. and Jere Mead (Harvard University, School of Public Health, Dept. of Physiology, Boston, Mass.).
Journal of Applied Physiology, vol. 27, Aug. 1969, p. 191-197. 16 refs.
PHS Grant No. GM-409; Grant No. NsG(T)-89.

Study of six normal human subjects exposed to oxygen for 3 hr, to gain some understanding of the relative importance of the atelectatic and direct toxic effects of oxygen. Quasi-static volume-pressure curves were recorded during the first and subsequent deep breaths immediately after the exposure periods. The ambient pressures at which exposures and the respective measurements were made were 0.39, 0.50, 1.0, and 2.0 atmospheres absolute. The results of these experiments were compared with those obtained after 3-hr exposures to air (control), and 3-hr exposures to 50 per cent oxygen-50 per cent nitrogen at 2.0 atmospheres. It was found that symptoms of chest pain and coughing were provoked by the initial postexposure deep breath after oxygen in 14 out of 24 experiments. In the experiments where symptoms occurred, the corresponding

inflation pressure-volume curves deviated from the air control curves, but only at high lung volumes. By contrast, oxygen-nitrogen mixtures generally failed to provoke these changes. Both symptoms and volume-pressure changes were reversed with repeated deep breaths. The results of these experiments were contrasted with a single, 11-hr exposure to oxygen at 2.0 atmospheres in which atelectasis was prevented and after which no changes in static properties could be discerned. (Author)

A69-40209
THERMOREGULATORY RESPONSES TO DEEP AND SUPERFICIAL COOLING IN SPINAL MAN.
J. A. Downey, J. M. Miller, and R. C. Darling (Columbia University, College of Physicians and Surgeons, Dept. of Rehabilitation Medicine, New York, N.Y.).
Journal of Applied Physiology, vol. 27, Aug. 1969, p. 209-212.
NIH Grant No. GM-11624-03.

Study in which the insentient portions of seven patients were cooled with spinal cord transection (levels T_2 to T_{11}) while the sentient skin was exposed to warm (32 to 34 deg C) or cool (22 to 24 deg C) ambient temperature. When the sentient skin was warm, increased oxygen comsumption and shivering occurred only when the ear canal temperature fell to 35.6 to 35.8 deg C. When the sentient skin was exposed to the cooler air, shivering occurred at higher levels of ear temperature in those patients with larger areas of sentient skin. The results are interpreted as confirming (1) the presence of deep temperature-sensitive structures, and (2) a possible interrelationship between skin and central temperature regulatory structures. (Author)

A69-40210
INFLUENCE OF RATE OF CHANGE IN SKIN TEMPERATURE ON SWEATING.
R. D. Wurster and R. D. McCook (Loyola University, Medical School, Dept. of Physiology, Hines, Ill.).
Journal of Applied Physiology, vol. 27, Aug. 1969, p. 237-240. 9 refs.
NIH Grant No. HE-08682.

Study in which step changes in ambient temperature (60 to 37 deg C) produced a rapid decrease in skin temperature and inhibition of sweating in ten male subjects. As the rate of decline of skin temperature approached zero, sweating increased despite lowered skin temperature and declining central temperatures (tympanic membrane and oral temperatures). In some experiments total suppression occurred, whereas in others only temporary suppression of sweating was observed. A hypothetical scheme is presented to explain these variations based on the temperature of the central thermosensitive structures, their relative levels of sensitivity, the rate of change of skin temperature, and the static skin temperature attained after the step change in ambient temperature. The marked influence of the rate of change in skin temperature on sweating suggests the involvement of cutaneous thermal receptors; however, the possibility of rate sensitivity of direct thermal influences on the sweat gland is not eliminated. (Author)

A69-40211
INFLUENCE OF SEASON AND HEAT ON ENERGY EXPENDITURE DURING REST AND EXERCISE.
Armand J. Gold, Abraham Zornitzer, and Shlomo Samueloff (Negev Institute for Arid Zone Research, Dept. of Environmental Physiology, Beersheva; Hadassah Medical School, Dept. of Physiology, Jerusalem, Israel).
(American Physiological Society, Autumn Meeting, 19th, Washington, D.C., Aug. 1967.)
Journal of Applied Physiology, vol. 27, July 1969, p. 9-12. 7 refs.

Examination of the influence of season on the energy expenditure of Israeli residents at several levels of physical activity and controlled ambient temperatures. Experiments were carried out on 17 volunteer male subjects (age range 22 to 39 years) during August and during January and February. Each subject was exposed in an environmental room to consecutive 30-min periods of (1) lying-resting, (2) sitting-reading, (3) ascending and descending a 13-cm step 20 times/min, (4) ascending and descending a 26-cm step 20 times/min, and (5) lying-resting under various temperature conditions. A modest, but consistent, increase in mean energy expenditure occurred at all levels of activity in the winter-thermoneutral, summer-hot, and winter-hot experiments over the summer-thermoneutral experiments. The increases ranged from 4 to 14% in periods 1 to 4 and 11 to 19% in recovery period 5. Increases in heart rate were generally greater. (Author)

A69-40212 #
SPACE-CABIN AND SUIT PRESSURES FOR AVOIDANCE OF DECOMPRESSION SICKNESS AND ALLEVIATION OF FIRE HAZARD.
T. H. Allen, D. A. Maio, S. E. Beard, and R. W. Bancroft (USAF, School of Aerospace Medicine, Physiology Div., Brooks AFB, Tex.).
Journal of Applied Physiology, vol. 27, July 1969, p. 13-17. 14 refs.

Observation of 29 men showing that a decompression within 1 min from 14.5 to 9.7 psia 33:67::O_2:N_2 can be taken without producing bends. Four hours later, after removal of 88 per cent of the dissolved N_2 which ultimately would leave the venous blood in the 9.7-psia atmosphere, it appears to be safe to decompress to 5 psia 70:30::O_2:N_2 but not to 3.5 psia O_2. Although mild bends occur after the 14.5- to 5-psia and, to a lesser degree, after the 9.7- to 5-psia decompressions, this is mostly relieved during recompression from 5 to 9.7 psia. Based on fire-hazard parameters, the greatest combustibility risk in manned spacecraft is at ground level during the 4-hr O_2 breathing required when facing the contingent use of a 3.5-psia suit. Avoidance of the hazards of both fire and bends certainly favors the higher pressure systems. (Author)

A69-40213
ENDURANCE TIME IN STATIC WORK DURING PARTIAL CURARIZATION.
Svend Molbech (Danish National Association for Infantile Paralysis, Hellerup, Denmark) and Sophus H. Johansen (Gentofte Hospital, Dept. of Anaesthesia II, Hellerup, Denmark).
Journal of Applied Physiology, vol. 27, July 1969, p. 44-48. 37 refs.
Research supported by the Arvid Nilsson's Foundation.

Study of a 50% reduction of normal maximum isometric strength in elbow flexion produced in three normal subjects with (+)-tubocurarine. Under these circumstances the endurance for static work was found relatively much more reduced than strength. Similar experiments with decamethonium in one subject demonstrated no change in the normal relation between endurance and strength. These findings are explained by the different sensitivity of the "slow" and "fast" muscle fibers toward the two neuromuscular blockers: (+)-tubocurarine attacks mainly the slow fibers, which are fit for sustained contractions, while decamethonium attacks the fast fibers, which are of more importance in maximum isometric strength mobilizations. The sensory feedback from the muscle spindles will be diminished by (+)-tubocurarine (but increased by decamethonium). This difference might contribute to the results, and explain why normal feeling of fatigue was depressed with (+)-tubocurarine, whereas after decamethonium the subject felt an initial increase in strength, subsequently followed by normal fatigue. (Author)

A69-40214 *
ROLE OF HEMATOCRIT, HEART MASS, AND HIGH-ALTITUDE EXPOSURE IN ACUTE HYPOXIA TOLERANCE.
R. R. Burton, A. H. Smith, J. C. Carlisle, and S. J. Sluka (California, University, Dept. of Animal Physiology, Davis, Calif.).

Journal of Applied Physiology, vol. 27, July 1969, p. 49-52. 22 refs. PHS Grant No. HE-01920; Grant No. NGR-05-004-008.

Determination of acute hypoxia tolerances in a nitrogen-dilution chamber on several groups of adult female chickens at sea level and 12,500-ft elevation. The hematocrits of some of these birds at both elevations were chronically altered with the use of sex hormones. Androgens increased the birds' hematocrits and tolerances to acute hypoxia at both elevations, whereas estrogens had the opposite effects. Birds native to high altitude had a 44 per cent greater tolerance to acute hypoxia than sea-level birds. Approximately half of this change resulted from an increase in the hematocrit, while the remainder was attributed to other nonhematocrit-related high-altitude adaptates. High-altitude birds, after transfer to sea level, exhibited a reduction in their acute hypoxia tolerance—after two days it was 14 per cent less than sea-level controls. Eighteen days later, hypoxia tolerances in sea-level birds and those previously at high altitude were equal. (Author)

A69-40215
HUMAN METABOLIC RESPONSES TO HYPERTHERMIA DURING MILD TO MAXIMAL EXERCISE.

L. B. Rowell, G. L. Brengelmann, J. A. Murray, K. K. Kraning, II, and F. Kusumi (Washington, University, Dept. of Medicine and Dept. of Physiology and Dept. of Biophysics and School of Nursing, Seattle, Wash.).

Journal of Applied Physiology, vol. 26, Apr. 1969, p. 395-402. 32 refs.

Research supported by the Washington State Heart Association.

Study carried out to determine whether $\dot{V}_{O_2}$ is increased or decreased in hyperthermic exercising men. Arguments for both possibilities have been advanced. In 54 men studied in three different experimental protocols, increased temperature of skin, blood, and rectum had no effect on submaximal $\dot{V}_{O_2}$. $\dot{V}_{O_2}$ at 25.6 deg C was compared with $\dot{V}_{O_2}$ under the following conditions: (1) prolonged work requiring 41 to 54 per cent of maximal $\dot{V}_{O_2}$ at 48.9 deg C (seven men); (2) prolonged work requiring 26 to 64 per cent of maximal $\dot{V}_{O_2}$ during which skin temperature was rapidly changed (via a water-perfused suit) at 30-min intervals from approximately 33 deg C to 38, 26, and 39 deg C (16 men); (3) four 15-min periods of graded exercise requiring 25 to 85 per cent of maximal $\dot{V}_{O_2}$ at 43.3 deg C (27 men). In these 27 men at 43.3 deg C and four other subjects at 48.9 deg C maximal $\dot{V}_{O_2}$ was reduced 3 per cent (P less than 0.01). Results indicate negligible extra costs of increased cardiac output, $\dot{V}E$, and sweating, and an increase in muscle efficiency at least offsetting Q_{10} effects. (Author)

A69-40216
THEORY OF SHEET FLOW IN LUNG ALVEOLI.

Y. C. Fung (California, University, San Diego, Calif.) and S. S. Sobin (Southern California, University, Los Angeles, Calif.).

Journal of Applied Physiology, vol. 26, Apr. 1969, p. 472-488. 19 refs.

PHS Grant No. HE-1152; NSF Grant No. GK-1415; Grant No. AF AFOSR 1186-67.

Consideration of the flow pattern of the blood in a sheet flow. A theoretical approach as well as a large-scale model study has been undertaken to determine the streamlines, the velocity distribution, and the pressure gradient in the pulmonary alveolar septa. The role of the elasticity of the system is considered. It is shown that in the range of linear elasticity, the fourth power of the thickness of the sheet satisfies the Laplace equation. The thickness distribution as a function of pulmonary arterial pressure, venous pressure, and alveolar air pressure is illustrated by several examples. (Author)

A69-40217 #
PORTABLE, MULTIUNIT LOW-PRESSURE CHAMBER WITH LOCKS.

John L. Steele and David A. Vaughan (USAF, School of Aerospace Medicine, Biosciences Div., Pharmacology-Biochemistry Branch, Brooks AFB, Tex.).

Journal of Applied Physiology, vol. 26, Apr. 1969, p. 492, 493.

Description of a portable, multiunit low-pressure chamber with locks. This device is designed to be used in small-animal experiments and permits the investigator to introduce and remove food dishes and replenish drinking water while the animal is continuously exposed to low pressures and experimental gas mixtures. (Author)

A69-40218
ENERGY COST OF PILOTING FIXED- AND ROTARY-WING AIRCRAFT.

D. E. Littell (U.S. Army, Aeromedical Research Unit, Fort Rucker, Ala.) and R. J. T. Joy (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.).

Journal of Applied Physiology, vol. 26, Mar. 1969, p. 282-285. 11 refs.

Investigation of the energy cost of piloting three U.S. Army helicopters (light, utility, and medium) and one utility fixed-wing aircraft. Energy expenditure was calculated from expired minute volume and expired air oxygen content measured during the basal state and in normal flight conditions. Data were collected on a total of 16 pilots, 5 of whom flew all three helicopters. All of the helicopter pilots were experienced test pilots. The data indicate that, for these pilots and flying conditions studied (level flight in good weather), the energy cost must be classed as very light work, averaging 1.79 kcal/min. The energy cost of flying the fixed-wing aircraft by less experienced pilots was similar to previously reported energy expenditures for such aircraft. The data were segregated to separate measurements made at altitude from those made during flight in close proximity to the ground. In three of the four aircraft, the pilot's energy expenditure was greater when ground contact was possible. (Author)

A69-40219
EXERCISE-TEMPERATURE REGULATION IN MAN DURING ACUTE EXPOSURE TO SIMULATED ALTITUDE.

J. E. Greenleaf, Carol J. Greenleaf, D. H. Card, and Bengt Saltin (Gymnastik-och idrottshögskolan, Stockholm, Sweden).

Journal of Applied Physiology, vol. 26, Mar. 1969, p. 290-296. 18 refs.

Research supported by the United Life Insurance Co. of Stockholm, and the Swedish Sport Federation.

Investigation of the relative load hypothesis for the control of exercise-temperature regulation. Esophageal, rectal, and skin temperatures were measured in three trained men during a one-hour constant submaximal workload at 350-, 2000-, and 4000-m simulated altitude. From the results obtained it is concluded that the "setting" of the equilibrium level of exercise core temperature is related to the absolute load and is associated with changes in the rate of sweating and tissue conductance. The latter two variables appear related to the degree of stress imposed—*i.e.*, to the relative workload. P.G.

A69-40220
ENERGY EXPENDITURE IN WORK PREDICTED FROM HEART RATE AND PULMONARY VENTILATION.

S. R. Datta and N. L. Ramanathan (All-India Institute of Hygiene and Public Health, Industrial Health Research Unit, Calcutta, India).

Journal of Applied Physiology, vol. 26, Mar. 1969, p. 297-302. 19 refs.

Investigation of regression relations for energy expenditure with pulmonary ventilation and heart rate. Experiments were carried out with volunteers carrying loads upstairs. From the fact that the regressions obtained had correlation constants of 0.90 and 0.88, respectively, it is concluded that both pulmonary ventilation and heart rate yield acceptable estimates of the energy expenditure. It is further inferred that pulmonary ventilation is relatively more suitable for assessing the human energy cost of homogeneous groups with sufficient accuracy for field and industrial studies. P.G.

A69-40221
RESPIRATORY GAS EXCHANGE IN EXERCISE DURING HELIUM-OXYGEN BREATHING.
T. M. Murphy, W. H. Clark, I. P. B. Buckingham, and W. A. Young.
Journal of Applied Physiology, vol. 26, Mar. 1969, p. 303-307. 12 refs.
Defence Research Board of Canada Grant No. 9310-108.

Six subjects were exercised on a treadmill while breathing air or 21 per cent oxygen in helium through a low-resistance valve. Ventilation, oxygen uptake, and carbon dioxide output during breathing were compared with values for air breathing at each workload. The ventilations and carbon dioxide outputs were identical for the two gases. Though the oxygen uptakes were identical at low workloads, the value for helium-oxygen fell abruptly below that for air as the exercise increased. This appears to be due to the development of turbulent flow in the airways at lower ventilations during air breathing than during helium-oxygen breathing because of the lower density of the latter gas and a corresponding effect on the oxygen cost of breathing. Arterialized capillary blood taken at a high workload showed a carbon dioxide pressure 4 mm lower on helium-oxygen than on air, establishing the presence of hyperventilation. The carbon dioxide production must, therefore, be reduced along with the oxygen consumption although no corresponding fall in ventilation occurs. (Author)

A69-40222 #
VENTILATION, LUNG VOLUMES, AND GAS EXCHANGE DURING LOWER BODY NEGATIVE PRESSURE.
Anthony R. Dowell, Phillip G. Schmid, Donald O. Nutter, and Kent N. Sullivan (USAF, Aerospace Medical Research Laboratories, Biomedical Laboratory, Wright-Patterson AFB, Ohio).
Journal of Applied Physiology, vol. 26, Mar. 1969, p. 352-359. 31 refs.

Ventilation, lung volumes, and gas exchange were measured in six normal subjects before, during, and following the application of minus 40 mm Hg lower body negative pressure (LBNP). Mean arterial pressure was unchanged by LBNP, but heart rate increased significantly. Minute ventilation, respiratory frequency, and tidal volume were not significantly altered by the 1-hr exposure to LBNP. Oxygen uptake and carbon dioxide elimination decreased slightly, but the gas-exchange ratio remained constant. Measurement of lung volumes in five of the subjects showed significant increases in total lung capacity, vital capacity, and functional residual capacity. LBNP causes (1) pulmonary hypoperfusion by shifting blood from the central reservoir into the lower extremities, and (2) a caudal shift of the diaphragm similar to that found in the upright position. (Author)

A69-40223
YIELD STRESS OF NORMAL HUMAN BLOOD AS A FUNCTION OF ENDOGENOUS FIBRINOGEN.
Edward W. Merrill, Chon Shon Cheng, and Gerard A. Pelletier (Massachusetts Institute of Technology, Dept. of Chemical Engineering, Cambridge, Mass.).
Journal of Applied Physiology, vol. 26, Jan. 1969, p. 1-3. 10 refs.
PHS Grant No. HE-06423.

Analysis of over 100 samples of normal human blood (adjusted to a hematocrit of 40) leads to a simple relationship between yield stress and the square of the endogenous fibrinogen concentration, the constant of proportionality being a weak function of total protein concentration. A model including fibrinogen adsorption on red cells and coupling of adsorbed fibrinogen in pairs is proposed. (Author)

A69-40224
EFFECT OF CARBON MONOXIDE ON FUNCTION AND STRUCTURE OF THE LUNG.
Aron B. Fisher, Arthur E. Baue, D. F. Kelly (Pennsylvania, University, School of Veterinary Medicine, Laboratory of Pathology and Div. of Graduate Medicine, Dept. of Physiology, Philadelphia, Pa.), Richard W. Hyde (Pennsylvania, University, School of Veterinary Medicine, Laboratory of Pathology and Div. of Graduate Medicine, Dept. of Physiology, Philadelphia, Pa.; American Heart Association, New York, N.Y.), and John S. Reif.
Journal of Applied Physiology, vol. 26, Jan. 1969, p. 4-12. 25 refs.
NIH Grant No. HE-10324.

Four human subjects who inhaled 6 per cent carbon monoxide for 18 sec had no significant change in lung volumes, mechanical properties, or diffusing capacity. Further investigations of possible histotoxic effects of carbon monoxide were performed in seven anesthetized dogs. After insertion of a tracheal divider and occlusion of the left pulmonary artery with a balloon catheter, the left lung was ventilated for 14-20 min with a gas containing 8-14 per cent carbon monoxide, while the right lung breathed air or oxygen. Femoral artery blood carboxyhemoglobin saturation did not rise higher than 18 per cent. Measurements of diffusing capacity and pressure-volume curves of both lungs, and examination of the lungs by light- and electron microscopy failed to reveal changes which could be attributed to carbon monoxide inhalation. Another dog that developed a carboxyhemoglobin saturation of 61 per cent had congested, edematous, and hemorrhagic lungs. Therefore, the lung damage seen with carbon monoxide poisoning is probably related to impaired oxygen transport by the blood and is not a result of direct histotoxicity of the alveolar carbon monoxide. (Author)

A69-40225 #
VENTRICULAR PERFORMANCE DURING GRADED HYPOVOLEMIA INDUCED BY LOWER BODY NEGATIVE PRESSURE.
Donald O. Nutter, Victor W. Hurst, III, and Raymond H. Murray (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).
Journal of Applied Physiology, vol. 26, Jan. 1969, p. 23-30. 32 refs.

Left ventricular (LV) function was analyzed in intact, anesthetized dogs during graded hypovolemia produced by exposure to -30, -60, and -90 mm Hg lower body negative pressure. Aortic blood flow, ventricular pressure, and ventricular volume were measured and performance indices were calculated. Graded decreases in end-diastolic volume (EDV) produced significant and essentially linear decreases in LV pressure, the maximum derivative of pressure, ejection fraction, aortic flow, maximum aortic volume acceleration, peak power, and stroke work. The performance of the ventricle was shifted to the left and downward on the ventricular function curve. Circumferential shortening distance and mean wall force fell significantly as EDV decreased and were associated with an insignificant decrease in the mean rate of circumferential fiber shortening. The relative stability of shortening velocity during hypovolemia may reflect the reciprocal effects of length and tension on the intact myocardial wall. The data indicate that the net performance of the intact left ventricle decreases in a predictable manner, unaccompanied by deterioration of myocardial function, in response to graded decreases in filling volume. (Author)

A69-40226
OXYGEN UPTAKE DURING MAXIMAL TREADMILL AND BICYCLE EXERCISE.
Lars Hermansen (Gymnastik- och Idrottshögskolan, Stockholm, Sweden) and Bengt Saltin (Institute of Work Physiology, Oslo, Norway).
Journal of Applied Physiology, vol. 26, Jan. 1969, p. 31-37. 19 refs.
Research supported by the Tri-Centennial Fund of the Bank of Sweden, the United Life, Mutual Group Insurance Co., and the Swedish Sports Federation.

Fifty-five male subjects performed maximal exercise on the treadmill running uphill and on the bicycle ergometer with a pedal frequency of 50 rpm. The leveling-off criterion was applied to establish maximality; 0.28 liter/min higher oxygen uptakes were obtained during maximal running compared to bicycling. Forty-seven of the subjects had higher values on the treadmill. No significant differences were observed in maximal values for the work time,

pulmonary ventilation, blood lactate, and heart rate. Age or training condition did not seem to influence the obtained results. In six subjects maximal running uphill gave 0.20 liter/min higher oxygen uptake than running maximally at no inclination. At pedal frequencies of 60 or 70 rpm during the maximal bicycle exercise, 0.10 liter/min higher oxygen uptake was found compared to pedal frequencies of 50 or 80 rpm. (Author)

A69-40227
VENTILATION-PERFUSION RELATIONSHIPS DURING HIGH-ALTITUDE ADAPTATION.
P. Haab, D. R. Held, H. Ernst, and L. E. Farhi (Fribourg, University, Institute of Physiology, Fribourg, Switzerland; New York, State University, Dept. of Physiology, Buffalo, N.Y.).
Journal of Applied Physiology, vol. 26, Jan. 1969, p. 77-81. 16 refs. Research supported by the Swiss National Fund for Scientific Research.

The degree of functional inhomogeneity of the human lung was assessed at low altitude (2,000 ft) and during the first 5 days of exposure to an altitude of 11,500 ft by measuring the arterial-alveolar nitrogen and carbon dioxide differences. Neither one of these was modified by ascent to altitude and there was no significant change during the experimental period. It is concluded that the transition from low to high altitude alters the scatter of ventilation or perfusion, or both, in such a way as to decrease the gas exchange efficiency of the lung. This change offsets partly the benefits derived from the hyperventilation response. (Author)

A69-40228 #
EFFECT OF VIBRATION ON TOTAL VASCULAR RESISTANCE IN THE FORELIMB OF THE DOG.
A. James Liedtke and Phillip G. Schmid (USAF, Aerospace Research Laboratories, Wright-Patterson AFB, Ohio).
Journal of Applied Physiology, vol. 26, Jan. 1969, p. 95-100. 18 refs.

Whole-body, x-axis, mechanical vibration, defined in terms of frequency, peak acceleration, and displacement, was evaluated in six dogs to determine its effect on the peripheral circulation and vascular smooth muscle. Changes in total vascular resistance in the canine forelimb, perfused at constant flow rate, were used to measure alterations in smooth muscle tone. One forelimb in each animal remained neurally intact; the other forelimb was denervated. Vibration for each animal was varied to include frequencies of 9, 12, and 16 cycles/sec, at peak accelerations of 0.9, 1.2, and 1.6 g, and combined for a total of nine different runs. The order of assigning runs was randomized; each run lasted 1 min followed by 4-6 min recovery period. Vasodilation occurred in response to all levels of vibration in both the intact and denervated forelimbs. The magnitude of response varied inversely with frequency, directly with peak acceleration and displacement, and was much greater in the neurally intact limb. The maximum response occurred at 9 cycles/sec, 1.6 g peak acceleration, and 0.35 inches displacement. These findings are related to the tissue deformation caused by sinusoidal oscillation and suggest that the dilator response is part of a nerve reflex involving stretch receptors. (Author)

A69-40229
INFLUENCE OF UNILATERAL HYPOVENTILATION ON DISTRIBUTION OF PULMONARY BLOOD FLOW IN MAN.
Måns Arborelius, Jr. (Allmänna Sjukhuset, Malmö, Sweden).
Journal of Applied Physiology, vol. 26, Jan. 1969, p. 101-104. 16 refs.

Unilateral hypoventilation during bronchospirometry was produced in five healthy volunteers by obstructing the airway of the right lung. The partition of the pulmonary blood flow was measured by the percent of Kr-85 exhaled by each lung after intravenous injection. During hypoventilation with air, the perfusion of the right lung decreased significantly. Hypoventilation with oxygen only caused an insignificant decrease of the ipsilateral lung blood flow. Hypoxia in a hypoventilated lung thus is more important for the distribution of blood flow during local hypoventilation than are mechanical factors. The total ventilation decreased significantly during unilateral hypoventilation with air but not with oxygen, probably due to a more effective elimination of carbon dioxide when both ventilation and perfusion are directed toward one lung. The demonstrated mechanism will counteract oxygen desaturation of arterial blood flow during local hypoventilation. (Author)

A69-40230
A DIGITAL COMPUTER PROGRAM FOR CONSTRUCTING VENTILATION-PERFUSION LINES.
A. J. Olszowka and L. E. Farhi (New York, State University, Dept. of Physiology, Buffalo, N.Y.).
Journal of Applied Physiology, vol. 26, Jan. 1969, p. 141-146. 16 refs.
USAF-supported research; NIH Grant No. FR-00126; NSF Grant No. GP-7318; Contract No. N 00014-68-A-0216.

Description of a digital computer program that will calculate the alveolar and capillary blood gas compositions corresponding to any given set of ventilation-perfusion values. The program is applicable to subjects having abnormal hemoglobin concentrations or base excess, or both. Dissolved oxygen and inert gas exchange are considered in the calculations. The importance of nitrogen exchange at extremely low ventilation-perfusion values is discussed. (Author)

A69-40241
SOME ASPECTS OF LASER SAFETY.
K. D. Harris (Laser Associates, Ltd., Slough, Bucks., England).
IN: LASERS AND THE MECHANICAL ENGINEER; INSTITUTION OF MECHANICAL ENGINEERS, SYMPOSIUM, LONDON, ENGLAND, NOVEMBER 19, 20, 1968, PROCEEDINGS. (A69-40234 22-16)
Symposium co-sponsored by the Institution of Production Engineers and the Institution of Electrical Engineers.
London, Institution of Mechanical Engineers (IME Proceedings. Volume 183, Part 3D), 1969, p. 43-46.

Discussion of factors pertaining to safety in open-air laser applications. This class of laser applications includes all free-propagation cases for communication or ranging. The minimum safe viewing distance as a function of pulsed laser energy is presented, and beam attenuation by absorption and scattering is considered. Spatial considerations and possible interception time are discussed. G.R.

A69-40259 #
MISMATCH ERROR IN MEASURING SMALL LOSSES IN CIRCULATORS AND RECIPROCAL QUADRUPOLES (O POGRESHNOSTI RASSOGLASOVANIIA PRI IZMERENII MALYKH POTER' V TSIRKULIATORAKH I VZAIMNYKH CHETYREKHPOLIUSNIKAKH).
M. E. Gertsenshtein, V. R. Magnushevskii, and L. G. Solovei.
Radiotekhnika, vol. 24, July 1969, p. 91-98. In Russian.

Description of a method of measuring small losses in circulators using the analytic properties of the scattering matrix to eliminate the mismatch errors. The scattering matrix for a real, slightly mismatched circulator with small losses is interpreted. Two measuring methods, one using short-circuiting devices and the other using coupling waveguides, are discussed. The mismatch errors are eliminated by averaging the results of measurements based on two positions of the short circuiting devices or two lengths of the waveguides. Results of measurements of small losses in Y circulators in the S band by the method of two short-circuiting devices are evaluated. P.G.

A69-40261
DISTRIBUTION OF READINESS POTENTIAL, PRE-MOTION POSITIVITY, AND MOTOR POTENTIAL OF THE HUMAN

CEREBRAL CORTEX PRECEDING VOLUNTARY FINGER MOVEMENTS.

Lüder Deecke, Peter Scheid, and Hans H. Kornhuber (Ulm, Universität, Abteilung für Neurologie, Ulm; Freiburg, Universität, Neurologische Universitätsklinik, Abteilung für Neurophysiologie, Freiburg im Breisgau, West Germany).

Experimental Brain Research, vol. 7, no. 2, 1969, p. 158-168.

Research supported by the Deutsche Forschungsgemeinschaft and the Stiftung Volkswagenwerk.

Determination of the spatial distribution of amplitude and onset of potential changes in the human cerebral cortex preceding voluntary finger movements. Potentials recorded from the scalp of human subjects preceding voluntary finger movements may be divided into three components: (1) a slowly increasing surface negative readiness potential which starts about 850 msec before movement and is bilaterally symmetrical over the pre- and post-central region with a maximum at the vertex; (2) a premotion positivity which is also bilaterally symmetrical and starts about 86 msec before the onset of EMG; and (3) a surface negative motor potential which starts about 56 msec before the onset of movement in the EMG and has its maximum over the contralateral precentral hand area. M.M.

A69-40262

EVOKED RESPONSE CORRELATES OF PSYCHOPHYSICAL MAGNITUDE ESTIMATES FOR TACTILE STIMULATION IN MAN.

Ove Franzén and Kurt Offenloch (Massachusetts Institute of Technology, Research Laboratory of Electronics, Cambridge, Mass.).

Experimental Brain Research, vol. 8, no. 1, 1969, p. 1-18. 82 refs.

Research supported by the Sweden-America Foundation, the Swedish Council for Social Science Research; NIH Grant No. 1 PO 1 GM-14940-01.

Study of cortical responses evoked by transient sensory stimulation of the index and middle fingers, and recorded from the scalp over the contralateral primary somatic projection area in man. Stimulus amplitude and locus were systematically varied. The relationship between stimulus intensity and the magnitude of the evoked response is adequately described by a power function. The exponent of the psychophysical function generated under similar stimulus conditions is of approximately the same size. A mathematical model is presented to describe and predict spatial summation. A complete isomorphism between psychological and neurophysiological events is obtained. (Author)

A69-40263 *

CORTICAL RESPONSES TO LIGHT IN UNANESTHETIZED MONKEYS AND THEIR ALTERATION BY VISUAL SYSTEM LESIONS.

H. G. Vaughan, Jr. (Yeshiva University, Albert Einstein College of Medicine, Dept. of Neurology, Bronx, N.Y.) and C. G. Gross (Harvard University, Dept. of Psychology, Cambridge, Mass.).

Experimental Brain Research, vol. 8, no. 1, 1969, p. 19-36. 28 refs.

Research supported by the Hartford Foundation and the Rockefeller Foundation; NIH Grants No. MH-05673; No. MH-06723; No. MH-6418; No. HD-01907; No. 1-K3-NB-31-816; NSF Grants No. GB-4104; No. GB-6999; Grant No. NsG-496.

Study of visual responses evoked in unanesthetized rhesus monkeys, and recorded and averaged from epidural electrodes over striate, prestriate, inferotemporal and frontal cortex before and after unilateral striate lesions, unilateral optic tract section, and unilateral inferotemporal lesions. The early wavelets seen in the striate and prestriate responses were eliminated only by ipsilateral optic tract section or ipsilateral striate lesions. The slower components of the striate responses were drastically reduced by ipsilateral optic tract section. Contralateral optic tract section and striate ablation also reduced the amplitude of these components, but to a lesser extent. Whereas ipsilateral optic tract section markedly reduced the amplitude of the inferotemporal response, the most striking effect of ipsilateral striate ablation on this response was a reduction in its variability. The inferotemporal lesion had no effect on the striate responses. The results are related to the problems of visual input to cerebral cortex, the functions of the inferotemporal cortex, and the effects of occipital damage in man. (Author)

A69-40264 *

FIRING PATTERNS INDUCED BY SOUND IN SINGLE UNITS OF THE CEREBELLAR CORTEX.

R. J. Shofer (Yeshiva University, Albert Einstein College of Medicine, Dept. of Anatomy, Bronx, N.Y.) and M. J. Nahvi (Massachusetts Institute of Technology, Research Laboratory of Electronics and Dept. of Electrical Engineering, Cambridge, Mass.).

Experimental Brain Research, vol. 8, no. 4, 1969, p. 327-345. 34 refs.

NIH Grants No. 1 PO1GM-14940-01; No. NB-07512-01; Joint Services Electronics Program Contract No. FR 28-043-J6-00495; Grant No. NsG-496.

Investigation of unit activities evoked by auditory stimulation in the cerebellar cortex in the encephale isole cat. The results obtained indicate that a variety of response patterns can be obtained in cerebellar cortical units following 1/sec repetitive click as was revealed by differences in shape and time course of single unit poststimulus-time histograms. It has been found that evoked discharge latencies of click responsive units could be related to a surface negative component in the regional, evoked slow wave response. P.G.

A69-40265 *

ELECTROPHYSIOLOGICAL CORRELATES OF VISUAL PERCEPTUAL MASKING IN MONKEYS.

L. G. Fehmi, J. W. Adkins, and D. B. Lindsley (California, University, Brain Research Institute, Dept. of Psychology and Dept. of Physiology, Los Angeles, Calif.).

Experimental Brain Research, vol. 7, no. 4, 1969, p. 299-316. 29 refs.

Contract No. Nonr-4756; Grant No. NGL-05-007-049.

Investigation of the location of retroactive interference in monkeys. Monkeys were trained to discriminate with nearly 100 per cent accuracy between a square and a triangle presented simultaneously in a brief tachistoscopic flash. Perceptual masking was demonstrated by inability to perform this trained visual discrimination at better than chance level when the information flash was followed in less than 20 msec by a blank second flash. In order to determine the nature and locus of this retroactive visual perceptual masking effect, electrical potentials were recorded simultaneously from three points along the optic pathways—namely, the optic nerve or tract, the lateral geniculate body, and the visual cortex. From the results obtained it is concluded that the major locus of the interfering effects of a diffuse masking flash is in the retina. Perhaps some less significant interference also occurs in the lateral geniculate body and in visual cortical neurons. It is noted that the exact nature of the interaction and interference indicated within the retina cannot be specified on the basis of these results. P.G.

A69-40269

PLASTICITY OF HYPOTHALAMIC MOTIVATIONAL SYSTEMS.

R. A. Wise (California State College, Dept. of Psychology, Los Angeles, Calif.).

Science, vol. 165, Aug. 29, 1969, p. 929, 930.

National Research Council of Canada Grant No. APB-74; PHS Grant No. MH-03238-07.

Response to a criticism by Valenstein et al. (1969) of an explanation offered to account for a phenomenon reported by Valenstein et al. in a study of the effects of electrical stimulation in the lateral hypothalamic area of the sated rat. It is noted that the dividing issue is whether the stimulation experience results in a change in the drive specificity of the hypothalamic neutral elements

affected by the stimulation. Valenstein et al. assume that the observed behavioral changes imply changes in the motivational state of the animals—that if the animal does not eat on the first trial, but does eat later, a change in drive must have taken place. In the author's opinion, it cannot be concluded that an animal is not hungry on the first trial simply because it does not eat, since the eating behavior of hungry animals depends on a number of factors in addition to the amount of food deprivation they have undergone.
M.M.

A69-40271 #
A HYPOTHETICAL MARTIAN BIOSPHERE (GIPOTETICHESKAIA BIOSFERA MARSA).
K. A. Liubarskii.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 3-9. 24 refs. In Russian.

Visualization of the physical and life-supporting properties of a hypothetical biosphere of Mars on the basis of available data and theoretical considerations. The forms of life anticipated on Mars by various scientists are discussed. Reviewed specifically are theories proposed by Salisbury (1962) and Liubarskii (1968) concerning the adaptation of hypothetical Martian organisms to conditions prevailing on Mars. V.Z.

A69-40272 #
STUDY OF A MATHEMATICAL MODEL OF A LIFE SUPPORT SYSTEM (K ISSLEDOVANIIU MATEMATICHESKOI MODELI SISTEMY ZHIZNEOBESPECHENIIA).
V. A. Darg and B. G. Kovrov.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 10-14. In Russian.

Analysis of an expression essential in the optimization of a mathematical model describing the operation of a partially closed life support system consisting of a man, a recycling unit, a storage unit, and a waste disposal outlet. The expression is generalized to apply to an extended life support system containing a given number of auxiliary biological and physicochemical units forming a unified structure. Optimal parameters of the components of this life support system are determined with the aid of the generalized expression.
V.Z.

A69-40273 #
STUDIES OF THE BIOLOGICAL EFFECTIVENESS OF THE MYCELIUM OF THE CANTHARELLUS CIBARIUS MUSHROOM AND THE POSSIBILITIES OF USING IT AS FOODSTUFF (ISSLEDOVANIIA BIOLOGICHESKOI EFFEKTIVNOSTI MITSELIIA GRIBA LISICHKI (CANTHARELLUS CIBARIUS Fr.) I VOZMOZHNOSTI EGO ISPOL'ZOVANIIA V KACHESTVE PISHCHEVOGO PRODUKTA).
A. Torev and D. Toreva.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 14-16. In Russian.

Study of the nutritive value of the mycelium of *Cantharellus cibarius* on groups of rats, about 45 days old, kept for a period of 6 weeks on diets with or without 5 per cent additions of dry mycelium, dry milk, or sour milk and eggs. A comparison of the weight of the experimental and control rats at the end of this period suggests that the nutritive properties of the mycelium are higher than those of fresh and sour milk and are similar to those of eggs. V.Z.

A69-40275 #
SURVIVAL RATES OF CONTINUOUSLY CULTIVATED CHLORELLA AFTER A SINGLE EXPOSURE TO GAMMA RADIATION (VYZHIVAEMOST' KHLORELLY PRI NEPRERYVNOM KUL'TIVIROVANII POSLE ODNOKRATNOGO γ-OBLUCHENIIA).
I. S. Sakovich and L. K. Vekshina.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 24-27. 10 refs. In Russian.

Investigation of the survival rates of chlorella plants, grown on an agar nutrient medium in an air-carbon dioxide atmosphere, after single exposures to gamma radiation doses from 0.5 to 10 krad. A microcolony-counting technique is used for determining the numbers of dead cells and the damage sustained by the genetic and cytoplasm structures of the surviving cells. Curves of survival rates vs radiation doses are given. V.Z.

A69-40277 #
EFFECT OF A LOCAL STRESS LOAD ON THE DIFFERENTIATION OF IMMUNOCOMPETENT CELLS (VLIIANIE MESTNOGO STRESS-VOZDEISTVIIA NA DIFFERENTSIROVKU IMMUNOKOMPETENTNYKH KLETOK).
V. Ia. Ganina and K. A. Lebedev.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 37-41. 9 refs. In Russian.

Study of the proliferation and differentiation of immunocompetent cells in the lymphatic ganglia of 15 anatoxin-immunized male guinea pigs subjected to local stresses by the administration of an India ink suspension in a physiological solution into their hind legs. An increase in the number of antibody-producing cells is established in the lymphatic ganglia of animals slaughtered on the fifth through seventh days of the experiment. Possible mechanisms of morphological and functional changes in the cell population of the experimental guinea pigs are discussed. V.Z.

A69-40278 #
SPECIFIC FEATURES OF THE DEVELOPMENT AND PROLONGATION OF ARTIFICIAL HYPOBIOSIS IN RATS (OSOBENNOSTI RAZVITIIA I PROLONGIROVANIIA ISKUSSTVENNOGO GIPOBIOZA U KRYS).
L. L. Marfina, L. A. Karaseva, and N. N. Timofeev.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 41-48. 14 refs. In Russian.

Study of the EKG, EEG, and respiration and survival rates in white rats whose body temperature was gradually decreased, kept at 17 to 20 deg C for 24 hr, and then gradually increased to normal temperature in a 40-hr experiment. The rates of survival were 71.4 per cent in rats exposed to temperatures of 19 to 20 deg without motion constraint, 35.7 per cent in rats exposed to a temperature of 17 deg without motion constraint, and 25 per cent in rats kept in a fixed position. Changes in EKG, EEG, and respiration rates caused by the exposures are noted. V.Z.

A69-40279 #
DEPENDENCE OF THE CHANGE IN THE EVOKED ACTIVITY OF THE CEREBELLAR CORTEX OF WHITE RATS ON THE LEVEL OF ACTING ACCELERATION (ZAVISIMOST' IZMENENIIA VYZVANNOI AKTIVNOSTI KORY MOZZHECHKA BELYKH KRYS OT VELICHINY DEISTVUIUSHCHEGO USKORENIIA).
L. D. Klimovskaia and N. P. Smirnova.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 48-53. In Russian.

Study of the reactions of the cerebellar cortex to sciatic nerve stimulation in a group of 130 white rats subjected in a centrifuge to 4-min transverse accelerations ranging from 2 to 12 g. Depressed cerebellar cortex responses, becoming statistically well pronounced at accelerations of 4 g, are already established at accelerations of 2 g. The depressive effect of acceleration increased exponentially with higher acceleration rates. Threshold and superthreshold acceleration rates of 6.4 and 7.6 g are obtained for cerebellar cortex reactions to sciatic stimuli in these rats. V.Z.

A69-40280 #
STUDY OF THE WORKING CAPACITY OF A HUMAN OPERATOR DURING 64-HOUR WAKEFULNESS (ISSLEDOVANIE RABOTOSPOSOBNOSTI CHELOVEKA-OPERATORA PRI 64-CHASOVOM LISHENII SNA).
R. M. Baevskii, G. A. Berezina, B. A. Dushkov, F. P. Kosmolinskii, V. I. Kudriavtseva, T. D. Semenova, and S. A. Cherniaeva.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 53-61. 6 refs. In Russian.

Study of the performance of four healthy male individuals in the execution of various assignments and tests during a 64-hour period of wakefulness in an isolated chamber. The tests were designed to determine the physical, intellectual, and sensory capacities of the subjects under the strains of prolonged wakefulness. EEGs, EKGs, and pneumograms were also recorded during the period. The various symptoms of fatigue observed in the subjects during various phases of the experiments are evaluated. It is concluded that a human operator can maintain an adequate working capacity for 64 hours without sleep. V.Z.

A69-40281 #
BIOLOGICAL PRINCIPLES FOR CONSTRUCTING A MODEL OF THE SENSOMOTOR ACTIVITY OF A HUMAN OPERATOR (BIOLOGICHESKIE PRINTSIPY POSTROENIIA MODELI SENSOMOTORNOI DEIATEL'NOSTI CHELOVEKA-OPERATORA).
A. M. Volkov and A. K. Popov.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 61-65. In Russian.

Attempt to construct a biological model describing the sensomotor activity of a human spacecraft operator in response to various spacecraft-control related stimuli. Schemes of the relations between sensomotor components of the central nervous system are given in diagram form. A related computer algorithm is also outlined. V.Z.

A69-40282 #
SIMULATION OF VISUAL REMOTENESS PERCEPTION DURING VERTICAL TAKEOFF AND LANDING OF A FLIGHT VEHICLE (MODELIROVANIE ZRITEL'NOGO VOSPRIIATIIA UDALENNOSTI PRI VERTIKAL'NOM VZLETE I PRI POSADKE LETATEL'NOGO APPARATA).
Ia. Ia. Belik.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 66-70. In Russian.

Discussion of the properties of several mathematical models describing human perception of distance to the ground during takeoff and landing of a VTOL aircraft. The models covered in the study include: (1) a model based on a theory that the perceived dimensions of a reference feature are inversely proportional to the square of the distance, (2) a model based on the visual estimation of gradients in the increasing apparent dimensions of a reference feature during landing, and (3) ones based on the estimation of the apparent motion or the angle of convergence of reference points. A mathematical basis is also outlined for a distance perception model relying on the capacity of the eye to maintain a clear vision at varying distances. V.Z.

A69-40283 #
CHRONOTROPIC REACTION OF THE HUMAN HEART UNDER THE EFFECT OF ACCELERATION (KHRONOTROPNAIA REAKTSIIA SERDTSA PRI DEISTVII USKORENII NA CHELOVEKA).
E. P. Tikhomirov.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 71-75. 16 refs. In Russian.

Study of the chronotropic reaction of the heart in a total of 800 centrifuge tests performed on 88 individuals subjected to pelvis-to-head and spine-to-breast accelerations of up to 22 g, with durations increasing up to the tolerance limit. The occurrence of a sinusal tachycardia is established in various degrees in all the tests. The heart contraction rates ceased to increase at accelerations above 5 g in the pelvis-to-head direction, and at accelerations above 12 g applied at angles of 65 deg or 78 deg to a spine-to-breast direction. V.Z.

A69-40284 #
POSSIBILITY OF USING AN ARTIFICIAL ATMOSPHERE WITH A VARIABLE GAS COMPOSITION IN AIR-TIGHT CABINS (O VOZMOZHNOSTI ISPOL'ZOVANIIA V GERMETICHESKIKH KABINAKH ISKUSSTVENNOI ATMOSFERY S NESTATSIONARNYM GAZOVYM SOSTAVOM).
A. M. Genin, E. Ia. Shepelev, V. B. Malkin, A. D. Voskresenskii, I. G. Krasnykh, E. V. Loginova, D. G. Maksimov, M. F. Fomin, and V. S. Khalturin.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 75-81. 11 refs. In Russian.

Discussion of the effect of cyclic variations in the composition of the inhaled air on the physical condition of two healthy subjects performing routine work and scientific assignments during a 35-day confinement in a sealed chamber. The temperature of the air was kept between roughly 21 deg C and a limiting 39 deg C, the humidity varied from 40 to 80 per cent, the oxygen partial pressure varied from normal to about 110 and 320 mm Hg, and the carbon dioxide pressure varied from normal to about 15 mm Hg during the five experimental cycles. EKGs, EEGs, pneumograms, and X-ray pictures of the thorax and the heart showed no pathological changes during or after the experiment. V.Z.

A69-40285 #
EFFECT OF CYSTAMIN AND OF THE SHIELDING OF CERTAIN PARTS OF THE BODY ON THE FUNCTIONAL STATE OF THE GASTROINTESTINAL TRACT OF IRRADIATED RATS (VLIIANIE TSISTAMINA I EKRANIROVANIIA NEKOTORYKH OBLASTEI TELA NA FUNKTSIONAL'NOE SOSTOIANIE ZHELUDOCHNO-KISHECHNOGO TRAKTA U OBLUCHENNYKH KRYS).
I. G. Krasnykh, B. L. Razgovorov, and L. R. Tiutin.
Kosmicheskaia Biologiia i Meditsina, vol. 3, May-June 1969, p. 82. In Russian.

Brief discussion of an X-ray study of the tonic and evacuator functions of the gastrointestinal tract of 120 rats after exposure to a gamma radiation dose of 840 r. The head and the anterior part of the abdomen of the rats were shielded, or a cystamin preparation was administered into their abdomens to protect against radiation. The positive effect of shielding and cystamin administration on these functions in irradiated rats is discussed briefly. V.Z.

A69-40357 #
A COMPUTERIZED METHOD FOR CREWSTATION GEOMETRY EVALUATION.
Patrick W. Ryan, Michael J. Healy, and Robert Katz (Boeing Co., Seattle, Wash.).
American Institute of Aeronautics and Astronautics, Aerospace Computer Systems Conference, Los Angeles, Calif., Sept. 8-10, 1969, Paper 69-977. 11 p. 12 refs.
Members, $1.00; nonmembers, $1.50.
Contract No. N 00014-68-C-0289.

Summary of first-phase results of a Boeing/JANAIR (Joint Army Navy Aircraft Instrumentation Research) experimental development to establish a standardized method for evaluating crewstation geometry. The new evaluation technique determines whether any sized operator can perform required functions in any specified work station. A 23-pin-joint man-model is used for the development. Joint angular parameters synthesized by mathematically constrained optimization of a nonlinear objective function provide physical movement. The objective function minimized is defined as the

weighted squared deviations of the Euler angle parameters from specified preferred angles at each joint. Comparisons of the man-model movement vs human movement show negligible differences in practice, although current tests indicate statistical differences occur. A BOEMAN-I computer program system stores and retrieves data, performs geometry evaluations, and uses computer graphic displays. (Author)

A69-40370 * #
ENGINEERING AND OPERATIONAL EXPERIENCES RELATED TO LUNAR-SURFACE THERMAL-VACUUM QUALIFICATION OF THE APOLLO EXTRAVEHICULAR MOBILITY UNIT.
R. E. Sanders, J. P. Vincent, and H. E. Maples (NASA, Manned Spacecraft Center, Space Environment Test Div., Houston, Tex.).
American Institute of Aeronautics and Astronautics, American Society for Testing and Materials, and Institute of Environmental Sciences, Space Simulation Conference, 4th, Los Angeles, Calif., Sept. 8-10, 1969, AIAA Paper 69-992. 12 p. 6 refs.
Members, $1.00; nonmembers, $1.50.

Description of manned testing of extravehicular activity equipment in a high-fidelity thermal-vacuum environment. This testing was the qualification of the Apollo extravehicular mobility unit for a simulated lunar-surface thermal-vacuum environment. For this testing, unique systems, equipment, and techniques were developed because of the extravehicular-mobility-unit design and the high fidelity required of the simulated environment. These systems and equipment included a lunar-surface thermal simulator, a simulated lunar-thermal environment, a solar-beam fold mirror, a weight-relief and falling-restraint system for the crewman and his extravehicular-mobility-unit, and an environmental control system. (Author)

A69-40371 * #
A REAL-TIME PROCESSING SYSTEM FOR DETERMINATION OF METABOLIC RATES OF A SUITED ASTRONAUT.
Russell J. Kelly (Boeing Co., Houston, Tex.), George F. Humbert, and David G. Billingsley (NASA, Manned Spacecraft Center, Houston, Tex.).
American Institute of Aeronautics and Astronautics, American Society for Testing and Materials, and Institute of Environmental Sciences, Space Simulation Conference, 4th, Los Angeles, Calif., Sept. 8-10, 1969, AIAA Paper 69-993. 7 p.
Members, $1.00; nonmembers, $1.50.

The metabolic rate and total energy expenditure of a suited astronaut were estimated during thermal-vacuum crew-training tests and extravehicular-mobility-unit lunar qualification tests. The crewman was configured in the Apollo space suit with a portable life-support system, and his metabolic rate was estimated by using the electrocardiogram and the portable-life-support-system oxygen-bottle pressure decay as received from telemetry. These parameters were processed by the Acceptance Checkout Equipment Spacecraft computer in real time, and the results were displayed on an alpha numeric CRT. An accurate method for determining the heart rate from the electrocardiogram under conditions of strenuous exercise is presented. Comparisons of heart rate and oxygen utilization methods for the calculation of total energy expenditure are made with posttest analysis of carbon dioxide production. Constraints and limitations of each method are discussed. (Author)

A69-40761 *
STUDIES ON ERYTHROPOIESIS. II.
Henry Borsook, Karen Ratner, and Brenda Tattrie (California, University, Space Sciences Laboratory, Berkeley, Calif.).
Blood, vol. 34, July 1969, p. 32-41. 9 refs.
AEC-supported research; NIH Grant No. HE-01624; Grant No. NGR-05-003-020.

Description of a method of fractionating erythroblasts according to degree of maturation in about three hours at room temperature. The cells so obtained retained their full metabolic activity and were capable of differentiation and maturation. The method depends on three characteristics of erythroblasts which change during maturation: size, density, and greater resistance of immature as compared with mature erythroblasts to lysis by an antiserum for erythrocytes. G.R.

A69-40776
THE EFFECT OF HYPERBARIC OXYGEN ON METABOLISM OF THE GABA SHUNT.
W. S. Myles and J. D. Wood (Defense Research Establishment, Toronto, Canada).
Journal of Neurochemistry, vol. 16, 1969, p. 685-687. 6 refs.

Estimation of the contribution of the GABA shunt to the total metabolism of alpha ketoglutarate to succinate, and determination of the effect of oxygen at high pressure on the system under in vitro conditions. Experiments with rat brain homogenates estimate the percentage of the total metabolism of alpha ketogluterate to succinate, proceeding via the transaminase pathway, to be about 17 per cent in air and 10 per cent in oxygen at high pressure. The results do not support the hypothesis that this pathway constitutes an alternate pathway for the metabolism of alpha ketoglutarate to succinate under conditions of oxygen poisoning, since it appears to be more sensitive to oxygen than the direct pathway. B.H.

A69-40779
RESPONSIVENESS OF THE CORTEX AND VISUAL PATHWAY DURING TRANSIENT HYPOTENSION.
A. N. Nicholson, W. D. Macnamara, and R. G. Borland (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
Electroencephalography and Clinical Neurophysiology, vol. 25, 1968, p. 330-337. 21 refs.
(FPRC/1281)

Study of the responsiveness of the cortex and visual pathway during transient hypotension induced by increased gravitational stress. In particular, measurements are made of the intraocular pressure of the cat during transient hypotension induced by withdrawal of blood from the aorta. The percentage fall in intraocular pressure is related linearly to the percentage fall in mean aortic blood pressure. It is tentatively suggested that during hypotension the maintenance of consciousness may be related to enhanced thalamocortical responsiveness. Z.W.

A69-40784
ADVANCES IN BIOMEDICAL ENGINEERING AND MEDICAL PHYSICS. VOLUME 1.
S. N. Levine (New York, State University, College of Engineering, Stony Brook, N.Y.).
New York, Interscience Publishers, 1969. 413 p.
$16.

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PREFACE. S. N. Levine (New York, State University, Stony Brook, N.Y.), p. v.

ANALYSIS OF PULSATILE BLOOD FLOW. E. O. Attinger (Pennsylvania, Presbyterian-University; Pennsylvania, University, Philadelphia, Pa.), p. 1-59. 106 refs. (See A69-40785 22-04)

REVIEW OF CARDIAC BOOSTER PUMPS. C. W. Hall, D. Liotta, and M. E. De Bakey (Baylor University, Houston, Tex.), p. 61-75.

AN INTRACORPOREAL AUXILIARY VENTRICLE. A. Kantrowitz (New York, State University, New York, N.Y.), p. 77-117.

NEURAL MODELING. L. D. Harmon (Bell Telephone Laboratories, Inc., Murray Hill, N.J.) and E. R. Lewis (California, University, Berkeley, Calif.), p. 119-241.

OPTIMIZATION ASPECTS IN BIOLOGICAL CONTROL

THEORY. J. H. Milsum (McGill University, Montreal, Canada), p. 243-278. 33 refs. (See A69-40786 22-05)

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LASER SYSTEMS AND THEIR APPLICATIONS IN MEDICINE AND BIOLOGY. L. Goldman and R. J. Rockwell, Jr. (The Children's Hospital Research Foundation, Cincinnati, Ohio), p. 317-382.

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A69-40785

ANALYSIS OF PULSATILE BLOOD FLOW.

E. O. Attinger (Pennsylvania, Presbyterian-University, Medical Center, Research Institute; Pennsylvania, University, School of Veterinary Medicine, Dept. of Animal Biology, Philadelphia, Pa.).

IN: ADVANCES IN BIOMEDICAL ENGINEERING AND MEDICAL PHYSICS. VOLUME 1. (A69-40784 22-05)
Edited by S. N. Levine.
New York, Interscience Publishers, 1969, p. 1-59. 106 refs.
PHS Grant No. HE-09694.

Description of the physical characteristics of pulsatile blood flow in short vascular segments, with an extension of the theory to the entire vascular bed. A system of simultaneous equations is developed which expresses the balance of forces and the conservation of mass at every point in the fluid and its boundary, utilizing the equations of motion, continuity, and state. One-dimensional equations are solved by the method of characteristics. Assumptions underlying the analyses of pulsatile blood flow are evaluated. Using analogous acoustic or transmission line equations, a number of the segments first investigated can be joined together to simulate the behavior of a more complex vascular system. Theoretical results are compared with experimental data. G.R.

A69-40786

OPTIMIZATION ASPECTS IN BIOLOGICAL CONTROL THEORY.

John H. Milsum (McGill University, BioMedical Engineering Unit, Montreal, Canada).

IN: ADVANCES IN BIOMEDICAL ENGINEERING AND MEDICAL PHYSICS. VOLUME 1. (A69-40784 22-05)
Edited by S. N. Levine.
New York, Interscience Publishers, 1969, p. 243-278. 33 refs.

Survey of recent advances in applying control theory to biological systems, and discussion of the relevance of the optimization concept in these systems. Biological control structures are considered. Transfer functions and time-domain approaches are discussed, and aspects of hierarchical control and optimization are investigated. Receptors, neural information transfer, actuators, positive feedback and growth, and metabolic systems and oscillation are considered. Optimization is explored on an energetic and on an informational basis, and aspects of mathematical modeling, feedforward, prediction, and preprogramming are discussed. G.R.

A69-40787

TELEMETRY IN MEDICINE AND BIOLOGY.

Cesar A. Caceres (U.S. Public Health Service, National Center for Chronic Disease Control, Medical Systems Development Laboratory; George Washington University, School of Medicine, Washington, D.C.) and James K. Cooper.

IN: ADVANCES IN BIOMEDICAL ENGINEERING AND MEDICAL PHYSICS. VOLUME 1. (A69-40784 22-05)
Edited by S. N. Levine.
New York, Interscience Publishers, 1969, p. 279-316. 53 refs.

Discussion of the usage of telemetric systems in medicine and biology, and description of several ancillary items used with these systems. Checkout points and system response are discussed, and problems of practical telemetry are examined. Astronaut monitoring programs are outlined and aspects of data reduction are considered. Applications of telemetry in the field of animal research are discussed; various examples of telemetry in the areas of clinical medicine are presented, and monitoring systems for a number of applications are described. Recorded electrocardiograms can be sent to a computer over analog data phones and telephone lines for interpretation. An outlook of future developments involving multichannel systems is given. G.R.

A69-40792

THE EFFECT OF RESTORATION PROCESSES MAKES IT POSSIBLE TO DISTINGUISH INTENSE IRRADIATIONS AND LESS INTENSE IRRADIATIONS AMONG CHLORELLAE (L'EFFET DES PROCESSUS DE RESTAURATION PERMET DE DISTINGUER IRRADIATIONS AIGUËS ET IRRADIATIONS SUBAIGUËS CHEZ LES CHLORELLES).

Roland Gilet and Jacques Terrier (Commissariat à l'Energie Atomique, Centre d'Etudes Nucléaires de Grenoble, Grenoble, France).

Académie des Sciences (Paris), Comptes Rendus, Série D–Sciences Naturelles, vol. 269, no. 3, July 21, 1969, p. 383-385. 7 refs. In French.

Study of the restoration processes occurring in *Chlorella pyrenoidosa* after irradiation with gamma rays. On the basis of the fact that these processes are inhibited at 0 deg C, it is shown that it is these processes which modify the survival curves when the dosage rate decreases. A hypothesis of radiation action is presented which makes it possible to calculate the rates of these restoration processes at 25 deg C. F.R.L.

A69-40834

PHYSICAL EXERCISE UNDER HYPERBARIC OXYGEN PRESSURE.

Lennart Kaijser (Royal Caroline Institute, Dept. of Clinical Physiology, Stockholm, Sweden).

Life Sciences, vol. 8, Sept. 1, 1969, p. 929-934. 11 refs.

Study of six healthy male volunteers performing rhythmic dynamic forearm work on a spring-loaded hand ergometer in a hyperbaric chamber. Arterial and deep venous blood from the active forearm was sampled through percutaneous catheters. Sampling was made at rest and at the end of each period of exercise to determine the oxygen and carbon dioxide partial pressures, the pH, and the lactate and pyruvate concentrations. A study was made of the difference in the arterial and venous oxygen content during oxygen breathing at 3 atm abs and during airbreathing at 1 atm abs. The differences between the values obtained in both cases, and the lactate concentration and pH in the deep vein of the active forearm are presented in a graph. The implications of the experimental data are discussed. G.R.

A69-40835

THE CAT LOCAL ELECTRORETINOGRAM TO INCREMENTAL STIMULI.

R. W. Rodieck and R. W. Ford (Sydney, University, Dept. of Physiology, Brain Research Unit, Sydney, Australia).

Vision Research, vol. 9, Jan. 1969, p. 1-24. 57 refs.
Research supported by the National Health and Medical Research Council of Australia and the University of Sydney.

Study of the properties of the local electroretinogram (LERG) responses elicited by incremental changes in light intensity. Experiments performed on twenty-six adult cats are reported. A linear relationship between incremental stimuli and the LERG is described. The response of the pigment epithelium is shown not to contribute to the LERG recorded across the retina, in response to large-diameter stimulus spots. The components of the LERG responses to incremental stimuli are identified. B.H.

A69-40836
EARLY INHIBITION AND EXCITATION OF THE RETINAL GANGLION CELLS.
Mark D. Licker (New York, State University, School of Medicine, Neurosensory Laboratory and Dept. of Physiology, Buffalo, N.Y.).
Vision Research, vol. 9, Jan. 1969, p. 25-36. 12 refs.

Summary of experiments performed on anesthetized rabbits to establish the relationship of the a-wave of the electroretinogram to early inhibition of the retinal ganglion cells. Early inhibition was produced in most experiments by superimposing a brief, intense flash on a background of off firing. Measurements made from average response histograms of multiple-unit ganglion cell recordings taken at the surface of the retina show that the latency of earliest inhibition is several milliseconds shorter than that of earliest excitation. The inhibition always occurred during the negative trough of the transretinally recorded a-wave; excitation always started with the sharp upswing of the b-wave. Experimental conditions leading to b-wave delay relative to the a-wave caused enhanced inhibition and delay of excitation. The shorter latency of inhibition is interpreted as indicating that the inhibition arises within the visual cells and not in the neuronal network between the visual cells and ganglion cells. A hypothesis is presented suggesting that the a-wave produces the inhibition by defacilitating the flow of excitation from visual cells to bipolar cells by inducing a hyperpolarization of the proximal endings of the visual cells. (Author)

A69-40837
AUTOKINESIS AND THE PERCEPTION OF MOVEMENT—THE PHYSIOLOGY OF ECCENTRIC FIXATION.
R. A. Crone and H. F. E. Verduyn Lunel (Amsterdam, University, Eye Clinic, Amsterdam, Netherlands).
Vision Research, vol. 9, Jan. 1969, p. 89-101. 27 refs.

Description of an after-image method by means of which the average direction of fixation could be measured to within one min of arc. During autokinesis, fixation was found to lag behind the apparent movement. When a stationary target appeared to move during optokinetic stimulation, the mean eccentricity of fixation was 1-½ min of arc. Tracking a point of light which was really moving showed again that the fixation lagged behind the movement. The eccentricity of fixation was dependent upon the speed of the real movement. If, at very low speed, the mean eccentricity was less than 1 min of arc, real movement could not be distinguished from autokinesis. During fixation of a point of light in the dark, the mean eccentric fixation is the physiological correlate of the perception of movement and also the quantitative stimulus to tracking movements of the eye. (Author)

A69-40838
MONOCULAR ESTIMATES OF DISTANCE AND DIRECTION WITH STABILIZED AND NON-STABILIZED RETINAL IMAGES.
David S. Gilbert (California Institute of Technology, Biology Dept., Pasadena, Calif.).
Vision Research, vol. 9, Jan. 1969, p. 103-115. 29 refs.
NIH Grants No. NB-03627; No. GM-01335.

Study carried out to determine whether eye movements help the visual system measure distances. Using both stabilized and non-stabilized retinal images, two subjects tried to match distances and angles defined by bright, coplanar points about 2 deg apart. Within an experimental uncertainty of plus or minus 2 min arc, or 3 per cent of the distances to be matched, both subjects carried out matches as accurately with a stabilized image as with a nonstabilized image. Further, with a stabilized image, the distance and direction of a retinal point from the fovea were estimated with approximately the same accuracy as the point's distance and direction from another, nonfoveal point. These results indicate that accurate spatial estimates may be obtained from extrafoveal areas of the retina, and that eye movements do not improve the accuracy of spatial judgments. (Author)

A69-40839
THEORY OF THE STEREOSCOPIC SHADOW-CASTER—AN INSTRUMENT FOR THE STUDY OF BINOCULAR KINETIC SPACE PERCEPTION.
David N. Lee (Harvard University, Harvard Medical School, Boston, Mass.).
Vision Research, vol. 9, Jan. 1969, p. 145-156. 6 refs.
Research supported by the Boston City Hospital; Contract No. Nonr-1866(52).

Exposition of the theoretical foundation of the stereoscopic shadow-caster, and its application to photographic, stereoscopic projection. The stereoscopic shadow-caster is described as a simple and versatile instrument for the study of binocular stereopsis under kinetic viewing conditions. Objects in the stereoscopic scene can be moved easily, either by the experimenter or the observer, and the observer can move and interact with the objects. Thus the instrument is suitable for use with human infants and animals, as well as with adult subjects. Some current research applications are described. B.H.

A69-40840
A SPATIAL INTEGRATION EFFECT IN VISUAL ACUITY.
J. M. Findlay (J.J. Thomson Physical Laboratory, Reading, Berks., England).
Vision Research, vol. 9, Jan. 1969, p. 157-166. 12 refs.
Medical Research Council Grant No. G/964/278/B.

Investigation of the effect of grating size on the threshold for a 30-cycle-per-degree grating pattern, for various colors of illumination and target orientations. It is shown that under certain conditions the threshold decreases as the target size is increased, and this is attributed to spatial integration of information. (Author)

A69-40841
THE EFFECT OF BACKGROUND DENSITY ON THE ZÖLLNER ILLUSION.
G. K. Wallace and D. J. Crampin (Reading, University, Reading, Berks., England).
Vision Research, vol. 9, Jan. 1969, p. 167-177. 18 refs.

Measurement of the Zöllner illusion (distortion of two parallel lines when superimposed on a background of oblique intersecting lines) for intersect angles ranging from 2 to 45 deg with a constant pattern density. Maximum angle distortion is shown at 20 deg and declines to either side of this value. A number of explanations for these findings are offered, and the effect of pattern density changes on angle function is considered. The illusion is measured for two pattern densities covering the range from 2 to 20 deg. The results of these measurements show that increasing the pattern density multiplies the entire illusion function by a constant. B.H.

A69-40842
VISUAL SUPPRESSION DURING SMOOTH FOLLOWING AND SACCADIC EYE MOVEMENTS.
A. Starr, R. Angel, and H. Yeates (Stanford University, School of Medicine, Div. of Neurology, Stanford; Veterans Administration Hospital, Palo Alto, Calif.).
Vision Research, vol. 9, Jan. 1969, p. 195-197. 13 refs.
NIH Grant No. NB-31242.

Description of experiments using subjects with normal vision and eye movements to measure vision during the tracking of a horizontally moving object, in order to determine whether visual suppression is associated specifically with saccades or with smooth following movements. It is shown that, in subjects tracking a slow moving target, the ability to detect a light flash of threshold intensity was impaired during saccades, but not during smooth following movements. Some possible explanations are considered. B.H.

A69-40843 *
VISUAL BACKWARD MASKING OF A SINGLE LINE BY A SINGLE LINE.

Mary B. Parlee (Massachusetts Institute of Technology, Dept. of Psychology, Cambridge, Mass.).
Vision Research, vol. 9, Jan. 1969, p. 199-205. 8 refs.
Grant No. NsG-496.

Results of visual backward masking experiments to study the roles of overlapping and nonoverlapping contours when both the target and the masking stimuli are a straight line. Three experiments are reported in which the detectability of the target line was determined under conditions allowing precise control of the contour relationship—i.e., the amount of overlapping and nonoverlapping of the target line. Detailed results are presented for each experiment. B.H.

A69-40844
DIFFERENTIAL COLOR RESPONSES IN THE VISUAL CORTEX OF THE SQUIRREL MONKEY.
L. C. Massopust, Jr., L. R. Wolin, and S. Kadoya (Cleveland Psychiatric Institute, Laboratory of Neurophysiology, Cleveland, Ohio).
Vision Research, vol. 9, Apr. 1969, p. 465-473. 26 refs.
NIH-supported research.

Using narrow band pass spectral filters, color and neutral density white light stimuli were delivered to the eye of the squirrel monkey. Visually evoked potentials were recorded from the brain. A red sensitive occipital polar area with a blue sensitive "surround," a nondifferentially responding region, and a lateral small blue sensitive area were found on the surface cortex. The calcarine cortex was also examined, and only small differentially responding areas lying beneath the specific sensitive surface cortex areas were found. The majority of the deep calcarine cortex did not respond differentially. Differential potentials were also found in the pregeniculate optic tract fibers but not in emerging postgeniculate fibers. (Author)

A69-40845
NEURONAL ORGANIZATION OF THE INITIAL AFFERENT INFLOW IN THE CAT LGB.
I. A. Shevelev (Academy of Sciences, Institute of Higher Nervous Activity and Neurophysiology, Moscow, USSR).
Vision Research, vol. 9, Apr. 1969, p. 475-492. 34 refs.

Direct investigation of the temporal organization of the initial afferent inflow in various parts of the visual system at the neuronal level. This study deals with the unit activity in the thalamic visual center—the lateral geniculate body (LGB) of unanesthetized cats. It concentrates on the fundamental sensory function—transmission and processing of signals that mark the beginning and the initial period of the stimulus action. For this 200 single LGB units were used to study thresholds, latencies, duration of the first burst, dependence of the response parameters on the flash intensity and duration, threshold intensity-duration curves (temporal summation), and the frequency characteristics of pulsation as well as statistical distribution of these values under total diffuse retinal illumination. (Author)

A69-40846
THE EFFECT OF PSYCHOPHARMACOLOGICAL DRUGS ON RETINAL NEURON ACTIVITY (DIE WIRKUNG VON PSYCHOPHARMAKA AUF DIE AKTIVITÄT RETINALER NEURONE).
Wolf-Dieter Heiss, Peter Heilig, and Jörg Hoyer (Wien, Universität, Vienna, Austria).
Vision Research, vol. 9, Apr. 1969, p. 493-506. 31 refs. In German.

Experimental research on the activity of a total of 328 individual optical nerve fibers in cats by means of microelectrodes. The effects of Chlorpromazine, Butyrylperazine, Chlorprothixen, Spiroperidol, Desipramin, Amitriptyline, and Diazepam on spontaneous and light-induced activity were investigated. It is shown that spontaneous activity decreased significantly with increasing doses of the psychopharmacological drugs. The effects of each drug are detailed, and it is noted that phasic response of the neurons to light stimuli was only slightly altered. Results confirm the findings of other investigators showing that psychopharmacological agents have a direct effect on the neural network of the retina, and support the assumption of the existence of synaptic transmitters and catecholamines. B.H.

A69-40847
THE EFFECT OF PSYCHOPHARMACOLOGICAL DRUGS ON VISUALLY EVOKED POTENTIALS IN CATS (DIE WIRKUNG VON PSYCHOPHARMAKA AUF VISUELL EVOZIERTE POTENTIALE DER KATZE).
Wolf-Dieter Heiss, Jörg Hoyer, and Peter Heilig (Wien, Universität, Vienna, Austria).
Vision Research, vol. 9, Apr. 1969, p. 507-513. 19 refs. In German.

Investigation of the changes in visually invoked responses due to the influence of Chlorpromazine, Butyrylperazine, Chlorprothixen, Haloperidol, Desipramin, Amitriptyline, and Diazepam, based on recordings from the visual cortex of 25 cats. The latencies of the responses increased with increasing doses of the agents, and on-responses in the evoked potentials of most of the animals were enlarged. In some experiments off-responses could be seen only under the influence of psychopharmacological drugs, while the off-responses of most animals increased in amplitude with higher dosages. The visually evoked potentials were accentuated as an effect of the drugs, and may be interpreted as resulting from a reduction of activating influences from other parts of the brain to the visual cortex, as well as from a decrease in spontaneous activity in the primary afferent system. B.H.

A69-40848
THE DISTRIBUTION OF DENDRITIC DOMAINS OF RETINAL NEURONES.
J. D. Moreland (London, University, Institute of Ophthalmology, Vision Research Unit, London, England).
Vision Research, vol. 9, Apr. 1969, p. 529-535. 8 refs.

Statistical critique of the values given by Polyak (1941) for the tangential dendritic spread of primate retinal neurons. Polyak's table of dendritic domains in the retinal neurons of man, chimpanzees, and rhesus monkeys is discussed, and some significant gaps are noted—namely, the absence of some of the diffuse varieties of bipolar and ganglion, and the absence of dimensions for receptor pedicles or amacrines. Some additional statistical material is presented which, while not considered to be exhaustive, seems to point to the conclusion that where a population of domains is dendritically homogeneous, or in the case of receptive field, synaptically homologous, $\log_{10}$ diameter of the domain is normally distributed about a mean. In addition, as an approximation, the standard deviation of that distribution is independent of the class or species of neuron.B.H.

A69-40849
ON LUMINANCE ADDITIVITY AND RELATED TOPICS.
Sherman L. Guth, Nola J. Donley, and R. T. Marrocco (Indiana University, Dept. of Psychology, Bloomington, Ind.).
Vision Research, vol. 9, May 1969, p. 537-575. 55 refs.
NSF Grants No. GB-2706; No. GB-2595.

Review of original and historical data regarding luminance additivity in terms of photometric techniques based on absolute foveal threshold, direct brightness matching, incremental threshold, and flicker photometry. Evidence is provided in support of an empirically based vector model which describes both bichromatic luminance additivity and color-matching data at or near threshold. New experiments which confirm that red-plus-green mixtures are grossly less than additive at threshold and high intensities are described. The result that green-plus-violet mixtures are less than additive at threshold but superadditive at high levels is reported. The facts of luminance additivity among normal and color-blind observers are discussed within the framework of a physiologically based trichromatic opponent-colors theory which suggests that absolute threshold, direct brightness matching, and incremental threshold

judgments are mediated by the combined outputs of an opponent-type chromatic system and a nonopponent achromatic system, whereas flicker judgments are mediated only by the nonopponent system. M.M.

A69-40850
THE RESPONSE OF THE HUMAN VISUAL SYSTEM TO MOVING SPATIALLY-PERIODIC PATTERNS.
David H. Foster (London, University, Imperial College of Science and Technology, Physics Dept., London, England).
Vision Research, vol. 9, May 1969, p. 577-590. 20 refs.

Study of the two critical frequencies that are associated with the visual observation of a moving, spatially periodic pattern. Data are given for the dependence of these frequencies upon the input parameters of the stimulus (e.g., spatial period and area). On the basis of these data, it is concluded that the system has features in common with the known optomotor response of certain insects. In particular, the system demonstrates the property of phase blindness and also a phenomenon probably related to the "pattern reversal" effect found in the case of the insect. It was found that the de Lange critical flicker frequency filters are insensitive to spatial variations on the phases of the input stimuli. A network, capable of detailed analysis, is suggested that functionally describes the behavior of the system. (Author)

A69-40851
SINUSOIDAL FLICKER CHARACTERISTICS OF THE COLOR-SENSITIVE MECHANISMS OF THE EYE.
Daniel G. Green (Michigan, University, Dept. of Ophthalmology, Ann Arbor, Mich.).
Vision Research, vol. 9, May 1969, p. 591-601. 20 refs.
PHS Grant No. NB-07579.

The flicker characteristics of the color-receptive systems of the eye were investigated by measuring the modulation thresholds for sinusoidal flicker of one color superimposed on a background of a complementary color. A procedure is outlined for comparing the flicker characteristics determined by using red, green, and blue stimuli. The results obtained indicate that the red and green mechanisms have frequency response characteristics with about equal peak sensitivity but differing in shape at low and intermediate rates of flicker The blue-sensitive mechanism has a reduced flicker fusion frequency which seems to be due largely to the depressed modulation sensitivity of the mechanism. (Author)

A69-40852
SELECTIVE STIMULATION OF TWO FORM-SENSITIVE MECHANISMS.
James P. Thomas, Frank M. Bagrash, and Larry G. Kerr (California, University, Dept. of Psychology, Los Angeles, Calif.).
Vision Research, vol. 9, May 1969, p. 625-627.
PHS Grant No. NB-07249.

Measurement of the luminance threshold for detection of a compound stimulus as a function of the relative luminances of its two components. The investigation demonstrated that at some point the threshold requirements change, signifying a change from detection by one mechanism to detection by the other. M.M.

A69-40853
AN ELEMENTAL THEORY OF INDUCTION.
A. M. Marsden (Nottingham University, Dept. of Electrical and Electronic Engineering, Nottingham, England).
Vision Research, vol. 9, June 1969, p. 653-663. 16 refs.

The brightness, or luminosity, of a fixated element in a visual field is a function of the luminance of that element, and to some extent of its size and color. Brightness is also affected by two other factors, firstly by whatever stimuli the eye was subjected to before viewing the element, secondly by the other stimuli simultaneously present in the field of view. There is considerable evidence (Marsden, 1968) to suggest that the second factor is more important than the first, luminance for luminance: stimuli in space exert a greater influence than stimuli in time. Induction appears to be second only to luminance in controlling the brightness of elements. (Author)

A69-40854
TEMPORAL AND SPATIAL INTERACTIONS INVOLVED IN THE BAND MOVEMENT PHENOMENON.
Vivianne C. Smith (Columbia University, New York, N.Y.).
Vision Research, vol. 9, June 1969, p. 665-676. 18 refs.
Contract No. Nonr-266(46).

Analysis of the time in the field at the band movement threshold. An explanatory model for the band movement phenomenon is described. The model suggests that the band movement's threshold is determined by luminance-dependent rise times of successive elementary areas traversed by the moving light. M.M.

A69-40855
COMPARISON OF SACCADIC EYE MOVEMENTS DURING FIXATION AND READING.
Robert J. Cunitz and Robert M. Steinman (Maryland, University, Dept. of Psychology, College Park, Md.).
Vision Research, vol. 9, June 1969, p. 683-693. 19 refs.
PHS Grants No. NB-06361-02; No. NB-06361-03.

Experimental investigation in which a contact lens-optical lever technique was used to record horizontal eye movements of two subjects while they read paragraphs of technical material or fixated a letter T. Large reading saccades and small fixation microsaccades displayed very similar distributions of intersaccadic intervals. Very few microsaccades occurred during pauses in normal reading. In those rare instances when they did occur, they occurred in the middle of reading pauses whose durations were twice as long as those usually observed. These results imply that both microsaccades and large reading saccades are scanning eye movements controlled by a single high-velocity eye movement system. M.M.

A69-40856
TRACKING EYE MOVEMENTS WITH AND WITHOUT SACCADIC CORRECTION.
Jane De Weese Puckett and Robert M. Steinman (Maryland, University, Dept. of Psychology, College Park, Md.).
Vision Research, vol. 9, June 1969, p. 695-703. 13 refs.
PHS Grant No. NB-06361.

A contact lens optical lever was used to record horizontal tracking eye movements made in response to unpredictable constant velocity target motions (1 to 15 deg of arc per sec). Subjects were instructed either to make frequent saccadic position corrections or to suppress saccades and follow the target, as much as possible, with smooth pursuits. Subjects were able to adopt these different tracking strategies; tracking error, when saccades were frequent, was much smaller than error when smooth pursuits were used almost exclusively. Eye position stability when the target was stationary, before and after movements, did not require saccades either when the target was in the preferred retinal fixation locus or when it fell as much as 2.5 deg arc from this position. Both subjects failed, generally, to match the velocity of the moving target with their smooth pursuits. (Author)

A69-40857
CYTOPLASMIC AND CILIARY CONNECTIONS BETWEEN THE INNER AND OUTER SEGMENTS OF MAMMALIAN VISUAL RECEPTORS.
Thomas M. Richardson (Harvard University, Biological Laboratories, Cambridge, Mass.).

Vision Research, vol. 9, July 1969, p. 727-731. 14 refs.
NSF-supported research.

Investigation of the ultrastructure of the visual receptors of several mammals such as the monkey, the rat, the guinea pig, and the ground squirrel. The results show that, in addition to the well-known ciliary connection between the inner and outer segments, there is also a cytoplasmatic bridge through which the cytoplasm of the inner segment comes into direct contact with the basal disks of the outer segment. Several new features of the connecting cilium are described. M.M.

A69-40858
THE TOPOGRAPHY OF THE AFFERENT PROJECTIONS IN THE CIRCUMSTRIATE VISUAL CORTEX OF THE MONKEY STUDIED BY THE NAUTA METHOD.
B. G. Cragg and A. Ainsworth (London, University, University College, Dept. of Anatomy, London, England).
Vision Research, vol. 9, July 1969, p. 733-747. 27 refs.

Determination of the meridians of the visual field in the circumstriate visual cortex of the monkey, by tracing degenerating axons stained preferentially by the Nauta method. The primary visual cortex in the monkey sends axons into a second and third visual area in the surrounding cortex. These connections are systematically arranged as in the cat. A further connection to the anterior face of the prelunate gyrus has a wide origin in the primary visual cortex. Cortical lesions affecting the first and second visual areas which represent the central vision cause the degeneration of a further projection to the crown of the prelunate gyrus, which thus extends the representation of central vision in the circumstriate visual cortex. The crown of the prelunate gyrus and the parts of the second and third visual areas that represent the vertical meridian through the center of gaze receive commissural connections from the corpus callosum. M.M.

A69-40859
THE SENSORY STIMULUS FOR DISJUNCTIVE EYE MOVEMENTS.
Gerald Westheimer and Donald E. Mitchell (California, University, Dept. of Physiology-Anatomy, Berkeley, Calif.).
Vision Research, vol. 9, July 1969, p. 749-755. 14 refs.
PHS Grant No. NB-08091.

Study of the central mechanisms that compare and correlate information coming in from the two human eyes. The limits of the stimulus situations within which horizontal eye vergence movements are initiated in human observers were mapped. Disparate visual configurations may be quite dissimilar in shape and contrast in the two eyes and may even be separated by about 100 msec in time and several degrees in the vertical direction and yet elicit normal horizontal vergence movements. In a subject with midline section of the cerebral commissures, presentation of a visual stimulus in which disparity alone is the cue for vergence is followed by convergence movements only when both disparate stimuli go to one cerebral hemisphere. M.M.

A69-40860
NEURAL LIMITATIONS OF VISUAL EXCITABILITY—AFTER-EFFECTS OF SUBLIMINAL STIMULATION.
William S. Battersby and Gretchen L. Defabaugh (New York, City University, Queens College, Dept. of Psychology, Flushing, N.Y.).
Vision Research, vol. 9, July 1969, p. 757-768. 30 refs.
PHS Grant No. NB-05395.

Changes in the threshold luminance for a 5 msec, 30 min visual angle, "test" flash (Ft), were studied as a function of temporal delay from a 5 msec subliminal (55 per cent of threshold) "conditioning" flash (Fc), set at either 30, 45, or 60 min in diameter. In one stimulating mode ("monocular"), both Fc and Ft were exposed to the same (right) eye; in another ("interocular"), Fc was presented to the left and Ft to the right eye. Temporal summation was obtained under both modes, and was greater in magnitude for monocular stimulation, was independent of Fc diameter, but was specific for the same (monocular), or homotopic (interocular) retinal locations. In all cases, perfect summation (energy additivity) was limited to about 20 msec interflash interval, and was followed by an additional 30 msec of partial summation. Collectively, the foregoing findings imply that central neural mechanisms are involved in determining threshold sensitivity. (Author)

A69-40861
SUBJECTIVE AND OBJECTIVE MEASUREMENT OF ADAPTATION TO DARKNESS USING THE SAME EQUIPMENT, AND APPLICATION OF THE LATTER TO A COMPARATIVE STUDY OF ADAPTATION FROM INFANCY TO ADULTHOOD (MESURE SUBJECTIVE ET OBJECTIVE DE L'ADAPTATION A L'OBSCURITE A L'AIDE DU MEME APPAREILLAGE ET APPLICATION DE CELUI-CI A L'ETUDE COMPARATIVE DE L'ADAPTATION DEPUIS L'ENFANCE JUSQU'A L'AGE ADULTE).
Guy Verriest and Günay Haznedaroglu (Gand, Université, Clinique Ophtalmologique, Ghent, Belgium).
Vision Research, vol. 9, July 1969, p. 769-783. 56 refs. In French.

Subjective and objective evaluation of adaptation to darkness using a combination of a variable-intensity light source with an optokinetic drum and an electronystagmographic device. The principal series of measurements concerned 60 human subjects subdivided into four classes of ages ranging from two and one-half to 29 years. The measurements clarify the relationship between the subjective and objective thresholds, and indicate that the thresholds are lowest at the end of the second decade of life. In the younger subjects all thresholds are higher and the adaptation speed is smaller in the photopic segment of the curve. M.M.

A69-40862
THE LINEAR MODELS OF THE PERCEPTION OF BRIGHTNESS (DIE LINEAREN MODELLE DES HELLIGKEITSSEHENS).
H. Giger (Bern, Universität, Augenklinik, Bern, Switzerland) and F. Fankhauser (Fliegerärztliches Institut, Dübendorf, Switzerland).
Vision Research, vol. 9, July 1969, p. 785-801. 31 refs. In German.
Research supported by the Schweizerischer Nationalfonds zur Förderung der wissenschaftlichen Forschung; NIH Grant No. NB-03638-04.

Discussion of models underlying the phenomena of brightness and contrast. The concept of self-excitation which has not so far been considered is introduced into the structure of the models. Mach bands can be described by two essentially different but formally identical mechanisms. This phenomenon cannot be explained functionally in terms of models presented heretofore, nor does it provide an answer to the question of whether data processing in the human visual system is based on integrating or differentiating procedures or on both. G.R.

A69-40867
THE SPECTRAL SENSITIVITY OF EVOKED POTENTIALS FROM THE RETINA AND CORTEX OF NOCTURNAL AND DIURNAL MONKEYS.
H. Ripps (New York University, Medical Center, Dept. of Ophthalmology, New York, N.Y.) and H. G. Vaughan, Jr. (Yeshiva University, Albert Einstein College of Medicine, Dept. of Neurology, New York, N.Y.).
Vision Research, vol. 9, Aug. 1969, p. 895-907. 33 refs.
PHS Grants No. NB-02589; No. MH-06723.

Determination of the spectral sensitivity functions of Rhesus and Aotes monkeys from simultaneous recordings of light-evoked cortical and retinal responses. In Aotes, a nocturnal anthropoid, the scotopic system dominated both the visual evoked potential and the electroretinogram. With Rhesus, on the other hand, rod activity was more prominent at the retina, but the cortical responses were subserved primarily by photopic processes. Analysis of the relative contributions of the photopic and scotopic mechanisms in the

evoked responses from these species suggests that retinal interaction effects, notably at the ganglion cell level, play an important role in determining the characteristics of the visual signals transmitted to the cortex. (Author)

A69-40868
THE EFFECT OF VISUAL CONTEXT ON PERCEPTION OF A FORM'S PARTS AS SUCCESSIVE.
Joseph H. McFarland and Michael Prete (Antioch College, Yellow Springs, Ohio).
Vision Research, vol. 9, Aug. 1969, p. 923-933. 20 refs.
PHS Grant No. MH-12449.

The succession threshold for the sides of a square contour is affected by presenting one line before and another line after the contour. Four experiments are designed to consider the possibility that this context effect is mediated by the mechanism underlying metacontrast. The results suggest that this effect is independent of the metacontrast mechanism and may be plausibly approached as dependent on a mechanism for "assigning" stimuli in a series to units of psychophysiological time. (Author)

A69-40869
THE PARAFOVEAL VISUAL RESPONSE OF A TRITANOPE AND AN INTERPRETATION OF THE Vλ SENSITIVITY FUNCTIONS OF MESOPIC VISION.
E. A. Hough and K. H. Ruddock (London, University, Imperial College of Science and Technology, Physics Dept., London, England).
Vision Research, vol. 9, Aug. 1969, p. 935-946. 34 refs.

Results of experiments with a tritanope and a trichromat to determine the parafoveal visual response of the tritanope. The apparatus and procedure of the experiments are described in detail, and results are plotted in a number of graphs. Spectral sensitivity functions were measured, and absolute threshold values were obtained. Color-matching data are presented for the tritanope, and the parafoveal relative sensitivity function for both subjects is plotted as a function of wavelength. The mesopic sensitivity function for both subjects was determined, and the results are summarized, showing that the spectral sensitivity function of the foveal cone system of the tritanope is normal, except for the nonfunctioning of the blue cone mechanism, which is considered to contribute little to the photopic luminosity curve. Brightness matching experiments between the annular and semicircular field show a near equality for the normal and tritanopic observer, suggesting that there is no marked change in the parafoveal cone sensitivity of the tritanope eye, as compared to the normal eye. It is concluded that the red-green cone system of the tritanope does not differ significantly from that of the normal observer. B.H.

A69-40870
CONTRAST SENSITIVITY OF THE HUMAN PERIPHERAL RETINA.
J. M. Daitch and D. G. Green (Michigan, University, Dept. of Ophthalmology, Ann Arbor, Mich.).
Vision Research, vol. 9, Aug. 1969, p. 947-952. 8 refs.
PHS Grants No. NB-07579; No. NB-05163.

Threshold contrasts were measured psychophysically for a sinusoidal grating target centered 12 deg in the peripheral retina. The relationship between contrast sensitivity, the reciprocal of the threshold contrast, and the spatial frequency of the gratings can be adequately described by the difference of two Gaussian functions. The parameters of the fitted Gaussians are used to describe the effects of varying the mean luminance of the target on the shape of the contrast sensitivity function. With increasing luminance the characteristic radii (parameters which are related to the width of the spread function of the visual system) decrease, while the overall contrast sensitivity of the eye increases. (Author)

A69-40871
HUE SHIFT AND BRIGHTNESS ENHANCEMENT OF FLICKERING LIGHT.
G. J. C. van der Horst and W. Muis (Utrecht, State University, Dept. of Medical and Physiological Physics, Physics Laboratory, Utrecht, Netherlands).
Vision Research, vol. 9, Aug. 1969, p. 953-963. 31 refs.

Measurement of the brightness enhancement of flickering light as a function of illuminance, wavelength, and target size. Data obtained with stimuli of seven different wavelengths show that the spectral composition has virtually no effect upon this Brücke-Bartley effect. When the illuminance was decreased, the frequency at which the enhancement was found to be maximal also decreased. In addition to the brightness gain, the apparent hue shift was determined. This shift might be explained by the Bezold-Brücke phenomenon and a possible phase shift between the different color signals. Von Békésy's model of a neural unit accounts for some of the details when the target size is decreased below 30 min of arc. (Author)

A69-40872
RETINAL TOPOGRAPHY AND THE BLUE-ARCS PHENOMENON.
J. D. Moreland (London, University, Institute of Ophthalmology, Vision Research Unit, London, England).
Vision Research, vol. 9, Aug. 1969, p. 965-976. 20 refs.

Some accurate plots of the blue arcs phenomenon are reported. The disparity in the location of photoreceptors and their associated neurones has been assessed and used to analyze critically sited plots. It is concluded that the site of arc generation is more proximal than the photoreceptor layer and more distal than the ganglion axon layer. Measurements on arc breadth as a function of stimulus breadth together with some on the depth of the ganglion axon layer suggest that physiological spreading from axons is effective only in the more proximal regions of the ganglion cell layer. This result, in conjunction with a determination of the least resolvable gap between two juxtaposed arcs, indicates that the small diffuse variety of ganglion cell is the most probable site of arc generation. (Author)

A69-40873
STUDY ON THE FORMATION OF RETINAL IMAGES AND DETERMINATION OF SPHERICAL ABERRATION OF THE HUMAN EYE (ETUDE DE LA FORMATION DES IMAGES RETINIENNES ET DETERMINATION DE L'ABERRATION DE SPHERICITE DE L'OEIL HUMAIN).
Françoise Berny (Paris, Université, Laboratoire d'Optique Physiologique and Institut d'Optique, Orsay, Essonne, France).
Vision Research, vol. 9, Aug. 1969, p. 977-990. 15 refs. In French.

Description of a knife-edge method derived from the classic Foucault test to measure spherical aberration in the optical system of the eye. The test, which is an extension to the human eye of a technique generally used for lenses, permits the determination of the relation between spherical aberration and retinal image quality. The image of a large slit object on the retina is used to measure tangential profile variations in the knife plane, and thus to calculate the meridian curve of the wavefront, excluding all but the spherical aberration in the measurement of defects. Some results of variations in optical accommodation and pupil aperture are given for the following categories: (1) the optimal wavefront related to the best image, (2) the corresponding illumination of a point source in the image, (3) the position of the best image and the microfluctuations of accommodation, and (4) the modulation transfer function of the optical system of the eye. B.H.

A69-40874
THE EFFECT OF ANGULAR VELOCITY OF STIMULUS ON HUMAN TORSIONAL EYE MOVEMENTS.

Andrew E. Kertesz and Richard W. Jones (Northwestern University, Dept. of Mechanical Engineering, Evanston, Ill.).
Vision Research, vol. 9, Aug. 1969, p. 995-998.
PHS Grant No. B-02165.

Results of three experiments using sectored disks to measure the magnitude of eye rotation around the line of sight, for the purpose of measuring the time course of the rotation. The torsional factors contributing to the magnitude of this rotation were the object of the investigation. Results of each experiment are plotted. B.H.

A69-40875
DYNAMIC VISCO-ELASTIC PROPERTIES OF THE LENS.
Masakazu Ejiri (Illinois, University, Biomedical Engineering Group, Chicago, Ill.), William D. O'Neill (Illinois, University, Biomedical Engineering Group, Chicago; Presbyterian St. Luke's Hospital, Chicago, Ill.), and Henry E. Thompson.
Vision Research, vol. 9, Feb. 1969, p. 233-244. 6 refs.
NIH Grant No. NB-06197.

Study of displacement responses of lenses extracted from cats and dogs for the case of sudden release of mechanical force applied on the lens anterior. The existence of three time constants is clarified through a computer-aided linear simulation, where the lens is regarded as a series connection of three pairs of springs and dashpots. Nonlinear simulation is also made, and the viscous coefficient of the lens is represented as a function of displacement. (Author)

A69-40876
THE INTERPLAY OF DRIFTS AND FLICKS IN BINOCULAR FIXATION.
Gaetan J. St.Cyr and Derek H. Fender (California Institute of Technology, Pasadena, Calif.).
Vision Research, vol. 9, Feb. 1969, p. 245-265. 24 refs.
NIH Grants No. NB-03627; No. GM-01335.

Examination of the mechanisms of eye-movement control during binocular fixation in order to determine the corrective roles of flicks and drifts. It is found that both types of motions correct fixational errors although flicks are somewhat more active in this respect. Vergence error is a stimulus for correction by drifts but not by flicks, while binocular vertical discrepancy of the visual axes does not trigger corrective movements. Z.W.

A69-40877
COMPARATIVE STUDY OF THE DIFFERENTIAL LUMINANCE THRESHOLD AND THE SPATIAL SUMMATION EXPONENT FOR SOLID AND ANNULAR OBJECTS WITH EQUAL SURFACES (ETUDE COMPARATIVE DU SEUIL DIFFERENTIEL DE LUMINANCE ET DE L'EXPOSANT DE SOMMATION SPATIALE POUR DES OBJETS PLEINS ET POUR DES OBJETS ANNULAIRES DE MEMES SURFACES).
Guy Verriest and Arturo Ortiz-Olmedo.
Vision Research, vol. 9, Feb. 1969, p. 267-282. 16 refs. In French.

Determination of the static and kinetic photopic increment thresholds along the superonasal and inferotemporal oblique meridians, by means of a modified Goldmann (1946) perimeter utilized in the ordinary photometric conditions. These thresholds are determined for the usual solid objects and for annular objects whose external circumference is equal to that of the usual full object while the surface is different. Under these conditions, the threshold increment is generally higher for the annular object than for the full object of the same surface. This corresponds to a decrease in the spatial summation exponent whose behavior is studied as a function of the object type and eccentricity. Z.W.

A69-40878
SPATIAL INTERACTIONS IN IDENTIFICATION AND DETECTION OF COMPOUND VISUAL STIMULI.
James P. Thomas, Gilbert J. Padilla, and Daniel L. Rourke (California, University, Dept. of Psychology, Los Angeles, Calif.).
Vision Research, vol. 9, Feb. 1969, p. 283-292. 8 refs.
PHS Grants No. NB-05185; No. NB-07249.

Determination of identification and detection thresholds for stimuli varying in width from 10 to 40 min of visual angle. Stimuli were presented singly or in pairs, a smaller and a larger one superimposed. In the pairs, the larger component was usually more easily identified and appeared to mediate detection. Both identification of the larger component and detection of the compound were facilitated by increasing the relative width of the smaller component. When the stimuli were presented singly, width had no reliable effect. The results suggest that stimulation is simultaneously processed by several receptive field mechanisms which are coaxial but have different spatial dimensions. The configuration of the stimulus determines which mechanism is dominant. (Author)

A69-40879
SCOTOPIC AND PHOTOPIC FUNCTIONS FOR VISUAL BAND MOVEMENT.
Vivianne C. Smith (Columbia University, New York, N.Y.).
Vision Research, vol. 9, Feb. 1969, p. 293-304. 24 refs.
Contract No. Nonr-266(46).

Investigation of the retinal mechanisms determining band movement thresholds obtained by manipulation of the parameters of retinal locus, luminance, arc length and spectral distribution of the stimulus. It is found that the velocity at threshold increases as luminance and arc length increase. The use of spectrally selective illuminants gave results suggesting that the response in white light for a 10 sec target at 5.7 deg from the fovea is determined by a scotopic mechanism at all luminances, and at 3.3 deg from the fovea by a scotopic mechanism at low luminances and a photopic mechanism at high luminances. Z.W.

A69-40880
THE PURKINJE SHIFT.
E. A. Hough and K. H. Ruddock (London, University, Imperial College of Science and Technology, Physics Dept., London, England).
Vision Research, vol. 9, Feb. 1969, p. 313-315. 10 refs.

Discussion of the contribution of the blue cone mechanism to the mesopic function in producing the Purkinje shift as luminance decreases. Measurements of the Purkinje shift were made in a tritanope. The sensitivity functions were measured by a flicker technique, using a white reference beam. The test stimuli were provided by the Wright colorimeter. It is suggested that the Purkinje shift in the normal observer is facilitated by the functioning of the blue cone mechanism. Z.W.

A69-40881
COMPARISON OF THE INTRARETINAL b-WAVE AND d.c. COMPONENT IN THE AREA CENTRALIS OF CAT RETINA.
R. H. Steinberg (U.S. Naval Aerospace Medical Center, Naval Aerospace Medical Institute, Pensacola, Fla.; U.S. Army Aeromedical Research Unit, Fort Rucker, Ala.).
Vision Research, vol. 9, Mar. 1969, p. 317-331. 20 refs.

The local electroretinogram was recorded with microelectrodes from the area centralis of cat retina. Evidence is presented that supports the separation of the dc component and the b-wave based upon differences in their sensitivity to qualities of the stimulus. The dc component occurred at a lower threshold, survived light adaptation, and summated within a smaller retinal area when compared to the b-wave. Vitreal injections of xylocaine hydrochloride (2 per cent), near the microelectrode tip, differentially affected the b-wave and the dc component. It is suggested that the dc component probably originates in bipolar cells and that the b-wave requires the excitation of a more widely convergent input, to the same or different bipolar cells. (Author)

A69-40882
HIGH-INTENSITY EFFECTS ON SLOW POTENTIALS AND GANGLION CELL ACTIVITY IN THE AREA CENTRALIS OF CAT RETINA.
R. H. Steinberg (U.S. Naval Aerospace Medical Center, Naval Aerospace Medical Institute, Pensacola, Fla.; U.S. Army Aeromedical Research Unit, Fort Rucker, Ala.).
Vision Research, vol. 9, Mar. 1969, p. 333-350. 27 refs.

The local electroretinogram (LERG), the late receptor potential (late RP), S-potentials, and the activity of ganglion cells were recorded with microelectrodes from the area centralis of cat retina in order to study the effects of high-intensity flashes. At relatively high intensities, both the dc component of the LERG and the late RP increased in duration, and their rates of decay were slowed. S-potentials showed similar effects. Ganglion cells exhibited an increase in on-response duration, which was accompanied by a weakening of the off-response. Intracellular recordings from the ganglion cell layer showed that at high intensities the steady-state postsynaptic potential persisted into the off-period as the rate of repolarization was slowed. (Author)

A69-40883
STRUCTURE OF THE CAT'S RETINA AFTER OCCLUSION OF THE RETINAL CIRCULATION.
Jonathan Stone (Johns Hopkins University, Medical School, Dept. of Physiology, Baltimore, Md.).
Vision Research, vol. 9, Mar. 1969, p. 351-356. 11 refs.
PHS Grant No. 5-P01-NB-06828.

A photocoagulator was used to occlude small arteries in the cat's retina, and the structure of the retinal areas thereby deprived of blood was examined by light microscopy. In these areas the fiber, ganglion cell, inner plexiform, horizontal cell, and outer plexiform layers appear to degenerate completely, while the receptor cells and a small number of bipolar cells were seen to survive. The outer nuclear layer was largely unaffected; the photoreceptor elements appeared quite intact. The animals used survived closure of the retinal arteries by 9 to 25 days. (Author)

A69-40884
PHYSIOLOGICAL VARIATIONS OF THE HUMAN ERG AS A FUNCTION OF THE LUMINOUS ENERGY AND THE WAVE LENGTH (VARIATIONS PHYSIOLOGIQUES DE L'ERG HUMAIN EN FONCTION DE L'ENERGIE LUMINEUSE ET DE LA LONGUEUR D'ONDE).
D. Samson-Dollfus (Hôtel-Dieu, Laboratoire de Physique Médicale, Rouen, France).
Vision Research, vol. 9, Mar. 1969, p. 357-364. 16 refs. In French.

Study of the amplitude of the principal waves of the electroretinogram (ERG) as a function of the stimulation energy. In light adaptation, the A-wave of the ERG has been studied in terms of the luminous energy for several wavelengths. It seems that a relationship exists between the amplitude of the A-wave and the logarithm of the energy. The A-wave has been also studied as a function of wavelength for equal luminous energy values. The graph obtained is very similar to that of the subjective luminous efficiency but it is shifted upward for the short wavelength. The dark adaptation for the B-wave was also investigated. A relationship exists between the B-wave and the logarithm of the energy between certain limits. Precise measures of the latency of the e-waves have been verified and have confirmed that the latency of the e-waves decreases when the stimulus energy increases. G.R.

A69-40885
TOPOGRAPHIC DISTRIBUTION OF OPTICALLY EVOKED POTENTIALS IN THE CORTEX OF MAN AT DIFFERING EXCITATIONS (TOPOGRAPHISCHE VERTEILUNG OPTISCH EVOZIERTER POTENTIALE ÜBER DIE HIRNRINDE DES MENSCHEN BEI UNTERSCHIEDLICHEN REIZEN).
Helmut Emrich (Max-Planck-Institut für Hirnforschung, Physiologische Abteilung, Göttingen, West Germany).
Vision Research, vol. 9, Mar. 1969, p. 365-376. 16 refs. In German.

Study of the topographic distribution of cortical potentials produced with a tachistoscope and by stroboscopic stimulation. It is found that the stroboscope evokes potentials which hardly differ occipitally and frontally. The tachistoscope gives a significant difference between frontal and occipital stimulation. Even though the front potentials are rather on the negative side while the rear potentials are more on the positive side, the direction of potential is conserved and there is no reversal in phase. The amplitudes increase in the occipital direction. The positive main component reacts more pronouncedly to a variation of conditions than the other components. There is a significant decrease in amplitude with extrafoveal stimulation. The amplitudes following stroboscopic stimulation are three times as high as those from tachistoscopic stimulation. The potentials evoked tachistoscopically differ quantitatively and qualitatively from those produced with the stroboscope. G.R.

A69-40886
THE TRANSPARENCY OF THE CORNEAL STROMA.
J. W. Smith (St. Andrews, University, Anatomy Dept., St. Andrews, Scotland).
Vision Research, vol. 9, Mar. 1969, p. 393-396. 12 refs.

The refractive indices of the collagen fibrils and of the ground substance of corneal stroma have been calculated from electron microscopic and chemical data as 1.384 and 1.369, respectively. It is suggested that the transparency of the cornea is the result of the close similarity of these two values rather than the arrangement of the collagen fibrils in a regular lattice. It is considered that this treatment also provides acceptable explanations of the clouding of the cornea that is produced by hydration or by raised intraocular pressure. (Author)

A69-40887
CONTRAST RESPONSE OF HUMAN VISUAL MECHANISMS SENSITIVE TO ORIENTATION AND DIRECTION OF MOTION.
Allan Pantle and Robert Sekuler (Northwestern University, Dept. of Psychology, Evanston, Ill.).
Vision Research, vol. 9, Mar. 1969, p. 397-406. 6 refs.
NIH Grant No. NB-06354.

Investigation of the response characteristics of human visual mechanisms sensitive to motion, while varying the contrast of an adaptation stimulus to control its visual effectiveness. It was found that a slowly moving grating of low spatial frequency differentially raises the threshold of various kinds of test targets. Systematic variation of the contrast of the adaptation grating separates two distinct components of this response. One component depends upon the grating's orientation and is a power function of contrast. This component is independent of the grating's movement. The other component is controlled by the direction of movement of the grating and is sensitive only to a restricted range of low contrasts. G.R.

A69-40888
MEASUREMENT OF THE MODULATION TRANSFER FUNCTION OF THE LIVING HUMAN EYE IN REFLECTED LIGHT (ZUR MESSUNG DER MODULATIONSÜBERTRAGUNGSFUNKTION DES LEBENDEN MENSCHLICHEN AUGES IM REFLEKTIERTEN LICHT).
R. Röhler, U. Miller, and M. Aberl (München, Universität, Institut für Medizinische Optik, Munich, West Germany).
Vision Research, vol. 9, Mar. 1969, p. 407-428. 18 refs. In German.

Study of the modulation transfer function of the living human eye in reflected light on the basis of a separate analysis of depolarized and polarized components of the light emerging from the eye. Linear polarized light reflected on the retina in the human eye is partly depolarized. The polarized and the depolarized component are analyzed by measuring the modulation transfer function for these components at various focusings. The reflection of these components

was measured as a function of pupil diameter and focusing. The influence of the pupil zone, through which the light leaves the eye, on the reflection results in different transfer functions. The results show that the reflected light that is not depolarized is correlated to the light which is absorbed and physiologically effective. This component is reflected at the same plane which is subjectively sharp. The reflectivity shows the same dependence on pupil area as subjective brightness (Stiles-Crawford effect). The modulation transfer function is in agreement with the subjective acuity. G.R.

A69-40889
VISUAL BEATS—DIFFERENTIAL BRIGHTNESS OF THE STIMULI AND ESTIMATION OF BRIGHTNESS.
Rathe Karrer (Illinois State Pediatric Institute, Chicago, Ill.).
Vision Research, vol. 9, Mar. 1969, p. 429-433. 11 refs.

Discussion of two experiments conducted to study the human response to visual beat phenomena. Visual beats, arising from dichoptic presentation of a different flicker frequency to each eye, are unaffected by widely divergent brightness of the two frequencies. Estimated perceived brightness of beats decreases as a function of flicker frequency and beat frequency. The data indicate that temporal processing is somewhat independent of brightness registration in flickering stimuli. G.R.

A69-40966 #
CHANGES IN THE FUNCTIONAL STATE OF THE CARDIOVASCULAR SYSTEM DURING LOCOMOTIONS (PRO ZMINI FUNKTSIONAL'NOGO STANU SERTSEVO-SUDINNOI SISTEMI PRI LOKOMOTSIIAKH).
M. V. Il'chevich, S. A. Bershtein, and L. I. Aleksiuk (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR).
Akademiia Nauk Ukrains'koi RSR, Dopovidi, Seriia B—Geologiia, Geofizika, Khimiia i Biologiia, vol. 31, July 1969, p. 644-647. In Ukrainian.

Investigation of the changes in the basic hemodynamic parameters of unanesthetized dogs made to run for 7 min at a speed of 10 km/hr. A pronounced increase in heart beat rate, arterial pressure, blood volume, and peripheral blood pressure was observed. The individual changes in these parameters and the corresponding recovery times are tabulated. V.P.

A69-40974 *
PRESSURE-DIAMETER RELATIONS OF CAPILLARIES AND SMALL BLOOD VESSELS IN FROG LUNG.
J. E. Maloney and B. L. Castle (NASA, Ames Research Center, Biotechnology Div., Moffett Field, Calif.).
Respiration Physiology, vol. 7, Aug. 1969, p. 150-162. 10 refs.

Static pressure-diameter measurements were made on the small pulmonary blood vessels of the frog lung, and the change in the septal area occupied by capillaries was investigated at intravascular pressures of 1 to 27 cm water. Over this pressure range, the smallest arteries (30 to 50 microns) increased their radius by 27 per cent, while the change for veins of the same size was 6 per cent. Medium size arteries and veins (50 to 150 microns) showed a similar pattern of increase in radius by 30 per cent, while the largest arteries (150 to 400 microns) increased their radius by 50 per cent, over the complete pressure range. Capillaries occupied 79 per cent of the alveolar septum at low intracapillary (1 cm water) pressures and less than 80.5 per cent at higher intracapillary pressures (27 cm water). These results indicate that the small arterial blood vessels of the lung are highly compliant and capable of large alterations in blood volume and resistance with changes in intravascular pressure. (Author)

A69-40975
CO_2 WASHOUT DURING HYPERVENTILATION IN MAN.
Giorgio Brandi (Modena, Università, Istituto di Fisiologia, Modena, Italy) and Marie Clode (Royal Postgraduate Medical School, Dept. of Medicine, London, England).
Respiration Physiology, vol. 7, Aug. 1969, p. 163-172. 19 refs.
Research supported by the British Heart Foundation.

Ventilation was regulated to produce a square-wave reduction of end-tidal carbon dioxide pressure, and the rate of carbon dioxide elimination from the body stores was measured to define the "carbon dioxide washout curve." This was resolved into two exponentials whose half-times were 1.12 and 13.4 min, respectively. The "nonmetabolic carbon dioxide" was 3.17 ml/kg per mm Hg. The fast carbon dioxide pool was 24 per cent of the total. The relative size of the two components and their time constants suggest that they originate from well perfused organs (brain, gastrointestinal tract) and poorly perfused tissues (resting skeletal muscle, connective tissue), respectively. If this holds true, no rate-limiting factor besides blood flow need be postulated. Slower adjustments, which might take place at cellular or cell membrane level, were not detected with this technique. (Author)

A69-40976
ALVEOLAR TO MIXED VENOUS P_{CO_2} DIFFERENCE UNDER CONDITIONS OF NO GAS EXCHANGE.
G. H. Gurtner, S. H. Song, and L. E. Farhi (New York, State University, School of Medicine, Dept. of Physiology, Buffalo, N.Y.).
Respiration Physiology, vol. 7, Aug. 1969, p. 173-187. 26 refs.
National Heart Institute Grant No. 7-F2-HE-23, 834-01A1; Contract No. N 00014-68-A-0216.

Discovery of a steady-state difference between alveolar and mixed venous carbon dioxide pressures under conditions in which no gas exchange occurs across the mammalian lung. The alveolar pressure is the higher. The carbon dioxide pressure difference appeared to be related to the positive hydrogen ion and the negative hydrogen carbonate ion concentrations of the mixed venous blood, and to the pulmonary flow rate. A model is presented involving a negatively charged capillary membrane and a coupling of viscous and diffusional flows. Evidence is given that steady-state differences of the undissociated form of the weak acid DMO can occur across the lung, and that under certain conditions carbon dioxide pressure differences can occur across charged artificial membranes. F.R.L.

A69-40977
RESPIRATORY RESPONSE TO HYPOXIA WITH HYPOCAPNIA OR NORMOCAPNIA AND TO CO_2 IN HYPOTHERMIC DOGS.
T. Natsui (Kanazawa University, School of Medicine, Dept. of Physiology, Kanazawa, Japan).
Respiration Physiology, vol. 7, Aug. 1969, p. 188-202. 27 refs.
Research supported by the Japanese Ministry of Education.

The effects of hypothermia on the ventilatory response to hypoxia and hypercapnia were studied in anesthetized dogs by a rebreathing method. The ventilatory response to hypoxia was determined at two levels of end-tidal carbon dioxide pressure: with carbon dioxide kept at control level and with carbon dioxide allowed to decrease. Experiments in hypothermia were conducted at about 10 deg C below normothermia, a temperature selected to give an air-breathing ventilation equal to that found in normothermia. At this temperature, gentle shivering occurred. The sensitivity to carbon dioxide without hypoxia was remarkably depressed in hypothermia. The ventilatory response to hypoxia with carbon dioxide kept at control level was also depressed and essentially the same as that with carbon dioxide allowed to decrease during normothermia or hypothermia. It is concluded that (1) the sensitivity of the central chemoreceptors to carbon dioxide is mainly depressed during hypothermia, and (2) hypothermia does not have much effect on the function of the peripheral chemoreceptors. (Author)

A69-40978
CALCULATING DIFFUSION IN BIOLOGICAL SYSTEMS BY RANDOM WALKS WITH SPECIAL REFERENCE TO GASEOUS DIFFUSION IN THE LUNG.

George R. Stibitz (Dartmouth College, Medical School, Dept. of Physiology, Hanover, N.H.).
Respiration Physiology, vol. 7, Aug. 1969, p. 230-262. 7 refs.
NIH Grant No. HE-02888-13.

Calculation of diffusion in biological systems, visualized as the drift of particles of a diffusate moving randomly within a medium. This concept is made quantitative and is taken as the basis for the calculation of flows and concentrations of a diffusate. In the calculation, the paths of individual particles are traced by successive steps, each of which is selected by a random process with appropriate probabilities. It is assumed that physically measurable quantities, like flux or concentration of diffusate, are really averages over many walks, whether those walks be taken by physical molecules or be calculated by a computer. In the lung, there are myriads of alveoli of similar but not identical shapes and sizes, connected by paths that are likewise variable from one part of the lung to another; it is the average diffusion in many regions that is of vital concern to the investigator. Methods of setting up walks for a very general class of diffusion phenomena are described, along with computer programs for tracing and evaluating such walks. Several examples are given, including a probabilistic "tree" model for portions of the lung.
F.R.L.

A69-40979
A LOW-RESISTANCE FLOW METER FOR WIDE-RANGE VENTILATORY MEASUREMENT.
O. Wigertz (Royal Caroline Institute, Dept. of Aviation Medicine, Stockholm, Sweden).
Respiration Physiology, vol. 7, Aug. 1969, p. 263-270. 6 refs.
Research supported by the Swedish Medical Research Council.

Description of a flowmeter unit operating on the venturi principle for recording of instantaneous ventilatory flow. The device, which is designed for unidirectional flow, is primarily dimensioned for measurements on humans and permits a single breathe-through system to cope with flow rates ranging from those during resting or subnormal ventilation to those occurring during heavy exercise. The pressure difference between the base and the throat of the meter exceeds the overall pressure loss by a factor of 5 or more, permitting the use of a standard differential pressure gauge for accurate translation of flow into an electronic signal. The unit incorporates electronic square root circuitry to obtain an output voltage that varies linearly with the instantaneous volume rate of flow. Linearity is within 1 per cent of the rated range of the meter. The unit is suitable for use with conventional electronic integrators for analog computation of tidal volumes. (Author)

A69-40995
AERIAL PHOTOGRAPHY FOR THE STUDY OF NEAR-SHORE OCEAN BIOLOGY.
Mahlon G. Kelly (New York University, Dept. of Biology, Bronx, N.Y.).
IN: NEW HORIZONS IN COLOR AERIAL PHOTOGRAPHY; PROCEEDINGS OF THE SEMINAR, NEW YORK, N.Y., JUNE 9-11, 1969. (A69-40985 22-14)
Seminar sponsored by the American Society of Photogrammetry and the Society of Photographic Scientists and Engineers.
Falls Church, Va., American Society of Photogrammetry, 1969, p. 347-355. 13 refs.
Contracts No. N-62306-2082; No. N-62306-69-C-0032.

Discussion of the application of aerial photography to a study of near-shore ecology on two sites (with nearly 200 sq mi areas), in the Bahama Banks south of Bimini and in Biscayne Bay south of Miami. The submarine and floor features observed in Biscayne Bay are described in detail. The efficiency of remote aerial photographs in studying the ocean bottom is evaluated. It is concluded that aerial surveys can be useful in mapping and generalizing the distribution of the biological cover on the ocean floor, in observing the basic environmental relationships of the submarine biological communities, and in analyzing the effects of man's activities on submarine life. V.Z.

A69-41066 #
SIMULATION OF AN ADEQUATE LIGHT SIGNAL BY ELECTRICAL STIMULATION OF THE VISUAL CEREBRAL CORTEX (MODELIROVANIE ADEKVATNOGO SVETOVOGO SIGNALA ELEKTRICHESKIM RAZDRAZHENIEM ZRITEL'NOI KORY MOZGA).
A. B. Kogan and E. B. Kompaneets.
Akademiia Nauk SSSR, Doklady, vol. 187, July 1, 1969, p. 215, 216. 10 refs. In Russian.

Investigation of the simulation of conditioned alimentary reflexes in response to light signals by electric signals in a group of ten anesthetized cats with electrodes inserted into their visual cerebral cortex. The results of extended experiments indicate that adequate alimentary reflexes can be obtained in most cases when this simulation technique is applied and observations are made over extended periods of time. V.Z.

A69-41067 #
ORIGIN AND FUNCTIONAL EFFECT OF INDUCED PRIMARY POTENTIALS OF THE CEREBRAL CORTEX (O PROISKHOZHDENII I FUNKTSIONAL'NOM ZNACHENII PERVICHNYKH VYZVANNYKH POTENTSIALOV KORY GOLOVNOGO MOZGA).
K. M. Kullanda.
Akademiia Nauk SSSR, Doklady, vol. 187, July 1, 1969, p. 220-223. 15 refs. In Russian.

Study of the primary responses of a group of anesthetized cats to the simulation of the counterlateral sciatic nerve by unipolar electrodes inserted into the somatosensory zone. A scheme is proposed to describe the functional relation between the individual phases of a primary response and the activity of the neurons. Hypothetic mechanisms of the generation of individual phases in various types of neuron responses to stimulation are shown in diagram form. V.Z.

A69-41076 *
PRODUCTION OF ADENOSINE TRIPHOSPHATE IN NORMAL CELLS AND SPORULATION MUTANTS OF BACILLUS SUBTILIS.
Walther Klofat, Grace Picciolo, Emmett W. Chappelle, and Ernst Freese (U.S. Public Health Service, National Institutes of Health, National Institute of Neurological Diseases and Stroke, Laboratory of Molecular Biology, Bethesda; NASA, Goddard Space Flight Center, Space Biology Branch, Greenbelt, Md.).
Journal of Biological Chemistry, vol. 244, June 25, 1969, p. 3270-3276. 16 refs.

Demonstration that the cellular concentration of adenosine triphosphate (ATP) does not decline during the developmental period in normal sporulating cells. However, such a decline was observed in most sporulating mutants that do not incorporate uracil. The response of ATP synthesis to different carbon sources can therefore be used to classify these sporulation mutants and to locate the blocked biochemical pathways. F.R.L.

A69-41077 *
STUDIES OF THE ELECTRON TRANSPORT CHAIN OF EXTREMELY HALOPHILIC BACTERIA. III—MECHANISM OF THE EFFECT OF SALT ON MENADIONE REDUCTASE.
Janos K. Lanyi (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
Journal of Biological Chemistry, vol. 244, Aug. 10, 1969, p. 4168-4173. 12 refs.

Description of the effects of monovalent and divalent cations and of polyamines on the menadione reductase activity for the purpose of exploring the mechanism of the salt dependence of this enzyme. There is no menadione reductase activity in the absence of salt. This activity increases with salt concentration to a maximum at 2 mol or higher concentrations of sodium chloride. The enzyme

activity lost at low salt concentrations can be restored by adding 2 mol NaCl. Z.W.

A69-41113 #
NEW DATA CONCERNING THE STEREOSCOPIC FIELD OF VISION OF HEALTHY INDIVIDUALS (NOVYE DANNYE OB OB'EMNOM POLE ZRENIIA U ZDOROVYKH LITS).
B. A. Tremeit.
Akademiia Nauk Kazakhskoi SSR, Vestnik, vol. 25, July 1969, p. 68-71. In Russian.

Application of a device recently developed for studying the stereoscopic field of vision to the determination of field-of-vision standards for healthy individuals. The standards obtained are tabulated for five age groups (20 to 30, 31 to 45, 46 to 55, 56 to 65, and above 65 years of age). The numerical data obtained can be used for representing graphically the stereoscopic field of vision of each age group. The relations obtained can be used as a basis for studying the stereoscopic field of vision in the case of eye sicknesses and disorders of the central nervous system. V.P.

A69-41121 #
EVOKED POTENTIALS OF THE FIELDS OF PRIMARY SOMATOSENSORY PROJECTIONS ON THE DORSOLATERAL SURFACE OF THE BRAIN CORTEX OF CATS (VYZVANNYE POTENTSIALY POLEI PERVICHNYKH SOMATOSENSORNYKH PROEKTSII NA DORSOLATERAL'NOI POVERKHNOSTI KORY MOZGA KOSHKI).
G. F. Kalistratov (Universitet Druzhby Narodov, Moscow, USSR).
Akademiia Nauk SSSR, Doklady, vol. 187, July 21, 1969, p. 689-692. 16 refs. In Russian.

Investigation of the characteristics of the primary responses of somatosensory fields (Sm I, Sm II, and Ms I) to electric signals in a group of 34 intravenously anesthetized cats whose bodies and brain cortices were kept at a uniform temperature of 37 to 38 deg C with the aid of a physiological solution. Bipolar electrodes were used for stimulating both the cortex and the contralateral sciatic nerve, and a "detailed corticographic" technique developed in 1962 by Kullanda was used in mapping the biological potentials evoked in Sm I, Sm II, and Ms I by electrical signals. The results of the study indicate the cortical nature of the relation between Sm I and Sm II. V.Z.

A69-41122 #
ACTIVATION OF THE SYNTHESIS OF PROTEIN AND RNA IN THE CEREBRUM AS A FACTOR OF ADAPTATION TO HIGH-ALTITUDE HYPOXIA (AKTIVATSIIA SINTEZA BELKA I RNK V GOLOVNOM MOZGE KAK FAKTOR ADAPTATSII K VYSOTNOI GIPOKSII).
F. Z. Meerson, M. Ia. Maizelis, V. B. Malkin, E. M. Leikina, R. M. Kruglikov, and N. A. Popko (Akademiia Meditsinskikh Nauk SSSR, Institut Normal'noi i Patologicheskoi Fiziologii, Moscow, USSR).
Akademiia Nauk SSSR, Doklady, vol. 187, July 21, 1969, p. 697-700. 10 refs. In Russian.

Study of the rates of protein and RNA synthesis in the cerebra of a total of 60 female rats kept in a pressure chamber at pressures corresponding to altitudes of 2000, 4000, 5000, 6000, and 7500 m increased successively during periods from 10 to 80 days. The rate of uptake of S 35-tagged methionine in the cerebrum, the medulla oblongata, and hypothalamus, and the RNA and DNA concentration in the cortex of the rats are determined. A comparison with the results for control rats suggest that hypoxia has a stimulating effect on the synthesis of protein and RNA in the cerebrum of experimental rats. V.Z.

A69-41138 #
HUMAN FACTORS IN FLIGHT TRAINING.
Alan Burrows (McDonnell-Douglas Corp., Douglas Aircraft Co., Long Beach, Calif.).
IN: FLIGHT SAFETY FOUNDATION, ANNUAL INTERNATIONAL AIR SAFETY SEMINAR, 21ST, ANAHEIM, CALIF., OCTOBER 8-11, 1968, TECHNICAL SUMMARY. (A69-41127 22-02)
Arlington, Va., Flight Safety Foundation, Inc., 1968, p. 91-97. 13 refs.

Discussion of the importance of human factors techniques in nonmilitary flight training. It is stressed that human factors techniques have not always received appropriate application in nonmilitary flight training though there are current trends to remedy this. It is noted that, in particular, the flight simulator and its systematic use are key problems for the immediate future. P.G.

A69-41146 #
MEDICAL PROBLEMS FACING AIR CARRIER PILOTS TODAY AND IN THE FUTURE.
Earl Carter (Mayo Clinic, Rochester, Minn.).
IN: FLIGHT SAFETY FOUNDATION, ANNUAL INTERNATIONAL AIR SAFETY SEMINAR, 21ST, ANAHEIM, CALIF., OCTOBER 8-11, 1968, TECHNICAL SUMMARY. (A69-41127 22-02)
Arlington, Va., Flight Safety Foundation, Inc., 1968, p. 191-198.

Brief review of the major forms of incapacitation for aircraft pilots. A variety of examples illustrates the point that, while many medical disorders may, on the surface, appear to be nonhazardous with respect to flight safety, a definite potential exists. It is pointed out that, from the purely medical standpoint, minimization and management of in-flight disorders is the task of the aerospace medical specialist. Operational and training aspects are not medical, but it is obvious that a cooperative effort is needed between medical and operational personnel in attacking the problem of unexpected in-flight medical disabilities. A particularly difficult problem from the medical aspect is the education of the pilot in the proper evaluation of his own symptoms. M.M.

A69-41150 #
NEW CONCEPTS IN IN-FLIGHT MONITORING.
Joseph Ferrarese (Federal Aviation Administration, Flight Standards Div., Washington, D.C.).
IN: FLIGHT SAFETY FOUNDATION, ANNUAL INTERNATIONAL AIR SAFETY SEMINAR, 21ST, ANAHEIM, CALIF., OCTOBER 8-11, 1968, TECHNICAL SUMMARY. (A69-41127 22-02)
Arlington, Va., Flight Safety Foundation, Inc., 1968, p. 223-228.

Discussion of a new concept of conducting initial training and checking of airline pilots in new equipment. The pilot training under the present program is briefly reviewed. The new training program is outlined, showing that it will produce a better, more thoroughly trained pilot for the following reasons: (1) by spending more time in the aircraft simulator, the pilot-trainee has more uninterrupted time to learn the maneuvers and procedures, (2) more productive time can be spent in the aircraft on the more important maneuvers during the initial flight phase, (3) during the line-flight phase, both the airline and FAA have a better yardstick to measure the effectiveness of the training program, and (4) the trainee receives a more rounded training course. The objectives which, it is hoped, will be achieved by this new program are: (1) to ensure a more realistic assessment of pilot competency, (2) to reduce nonrevenue flight time to a practicable minimum, and (3) minimum use of airspace by training aircraft. Z.W.

A69-41175 #
SOMATIC INDUCED POTENTIALS OF THE GYRUS CINGULI OF CATS (SOMATICHESKIE VYZVANNYE POTENTSIALY LIMBICHESKOI KORY KOSHKI).
Z. A. Vagramian (Akademiia Nauk Armianskoi SSR, Institut Fiziologii, Yerevan, Armenian SSR).
Akademiia Nauk Armianskoi SSR, Doklady, vol. 48, no. 4, 1969, p. 251-256. 11 refs. In Russian.

Investigation (on 39 anesthetized and unanesthetized cats) of the electric responses of the anterior and posterior gyrus cinguli to stimuli of the sciatic nerve. For unanesthetized animals, two types of potential are recorded in these regions. In the gyrus cinguli anterior, the potentials are brevilatent, having the form of biphase oscillations with an initial negative wave and a latency period of 10 to 16 msec. The gyrus cinguli posterior is characterized by secondary dolicholatent potentials with a latency period of 70 to 80 msec and an amplitude of 150 microvolts. They are complex three-phase or two-phase oscillations, where the initial negative phase lasting 30 to 40 msec is followed by positive oscillations of the same or slightly greater duration. A detailed analysis of the dolicholatent potentials leads to the conclusion that their origin may be attributed to the reticulothalamic tracts. V.P.

A69-41189
HYPOXIA AND EDEMA OF THE PERFUSED ISOLATED CANINE LUNG.
D. M. Nicoloff, H. M. Ballin, and M. B. Visscher (Minnesota, University, Dept. of Physiology, Minneapolis, Minn.).
Society for Experimental Biology and Medicine, Proceedings, vol. 131, May 1969, p. 22-26. 10 refs.
PHS Grant No. HE-03212.

Study of the effects of variations in oxygen saturation of the blood on rates of weight gain in the isolated perfused canine lung. The investigation was initiated partly to test the question of whether hypoxia of degrees compatible with survival of an animal did or did not induce pulmonary edema while pressure conditions were held constant. The results reported indicate that hypoxia at even lower levels of oxygen tension does not promote pulmonary edemogenesis. G.R.

A69-41190 *
SYMPATHETIC VASOCONSTRICTOR ACTIVITY TO THE KIDNEY IN CAROTID OCCLUSION PRESSOR REFLEX.
Juro Iriuchijima and Michael F. Wilson (West Virginia, University, Medical Center, Dept. of Physiology and Biophysics, Morgantown, W. Va.).
Society for Experimental Biology and Medicine, Proceedings, vol. 131, May 1969, p. 189-192. 13 refs.
NIH Grant No. HE-10234-03; Grant No. NGL-49-001-001.

Investigation of the question of whether the renal vascular bed is involved in the carotid occlusion pressor reflex in the absence of renal autoregulation. Renal flow was recorded by an electromagnetic flowmeter in anesthetized dogs to observe the behavior of sympathetic nerve induced vasoconstriction to the kidney. As a result of the studies, it is concluded that the renal circulation participates in the carotid occlusion pressor reflex, by undergoing vasoconstriction in the absence of renal autoregulation. G.R.

A69-41191 #
THE ABSORPTION OF MONOMETHYLHYDRAZINE THROUGH CANINE SKIN.
Edwin B. Smith and Dale A. Clark (USAF, School of Aerospace Medicine, Biosciences Div., Brooks AFB, Tex.).
Society for Experimental Biology and Medicine, Proceedings, vol. 131, May 1969, p. 226-232. 16 refs.

Study undertaken to ascertain how readily monomethylhydrazine (MMH) is absorbed through skin and to observe selected metabolic effects of MMH after percutaneous absorption. Graded doses of MMH were applied to the chest of anesthetized dogs. Within 3 to 5 min after application of large doses of MMH to the skin, methemoglobinemia was observed. Levels of methemoglobin rose to a peak at about 2 hr, then declined slowly. Peak levels varied directly with the dose of MMH applied and blood levels of methemoglobin and of MMH were closely correlated throughout the observation period. The absence of a decline in blood MMH levels after large doses was attributed to effects of MMH on metabolic systems of detoxication and/or excretion. G.R.

A69-41192
HYPERVENTILATION-INDUCED HEMOLYSIS IN THE DOG.
P. F. Iampietro, V. Fiorica, M. J. Burr, and R. Moses (Federal Aviation Administration, Civil Aeromedical Research Institute, Physiology Laboratory, Oklahoma City, Okla.).
Society for Experimental Biology and Medicine, Proceedings, vol. 130, Mar. 1969, p. 689-691.

Description of the results of recent determinations of pH and hemolysis in artificially ventilated anesthetized dogs. The dogs were hyperventilated via a respirator pump to increase blood pH to high levels. Canine erythrocytes hemolyze in vivo when blood pH is maintained at a high level for 30 min or longer. Hemolysis occurs whether the body temperature of the dog is rising or falling. M.M.

A69-41193
STUDIES ON HYPOXIA. IV.
M. S. Kim and S. S. Han (Michigan, University, Dept. of Anatomy and Dental Research Institute, Laboratory of Cell Biology, Ann Arbor, Mich.).
Society for Experimental Biology and Medicine, Proceedings, vol. 130, Apr. 1969, p. 1042-1045. 12 refs.
PHS Grants No. HD-03147; No. DE-02311; No. DE-02731.

Study of the effect of acute anoxia on the succinic dehydrogenase (SDH) and lactic dehydrogenase (LDH) activities in digestive glands and certain other organs that are sensitive to changes in oxygen tension. The results show that while both enzyme activities are suppressed in the organs studied, SDH activity is most suppressed in the heart, kidney, and pancreas. On the other hand, the submandibular gland shows a significant increase in LDH activity. These results support the view that the reduction of protein synthesis in different organs following exposure to anoxia is variable. Z.W.

A69-41194
RETARDED IMMUNOLOGICAL RECOVERY IN SUBLETHALLY X-IRRADIATED MICE BY ADDITIONAL THYMIC EXPOSURE—REVERSAL WITH INJECTED MARROW CELLS.
William E. Davis, Jr. and Leonard J. Cole (U.S. Naval Material Command, Naval Radiological Defense Laboratory, San Francisco, Calif.).
Society for Experimental Biology and Medicine, Proceedings, vol. 130, Apr. 1969, p. 1336-1344. 21 refs.
Navy-supported research.

Study of the dependence of the immunological recovery of X-irradiated mice on the recovery of thymic function and on recovery of immunologic stem cells of the marrow. The thymus of sublethally X-irradiated mice was reexposed to high doses of radiation, and the pool of marrow cells was augmented in other similarly treated animals. It is found that both the recovery of the thymic functions and the supply of marrow-derived immunologic precursor cells are important for the recovery of immunocompetence in sublethally irradiated mice. Z.W.

A69-41195
STUDIES ON HYPOXIA. III—EFFECTS ON LEUCINE-^{3}H INCORPORATION BY SUBMANDIBULAR GLAND CELLS OF RAT NEONATES.
Joon H. Kim and Seong S. Han (Michigan, University, Dept. of Anatomy and Dental Research Institute, Laboratory of Cell Biology, Ann Arbor, Mich.).
Society for Experimental Biology and Medicine, Proceedings, vol. 130, Feb. 1969, p. 470-473. 9 refs.
PHS Grants No. HD-03147; No. DE-02731; No. DE-02311.

Investigation of the effect of anoxia on leucine-^{3}H incorporation by submandibular gland cells of neonatal rats by means of quantitative radioautography. The results show that there is a marked suppression of the leucine incorporation during the first four hours following the anoxia administration. There is an apparent recovery by 24 hours, and no difference between the experimental

and control animals is observed after this time. It is concluded that the synthesis of overall cytoplasmic proteins is temporarily impaired after a brief exposure to anoxia in submandibular gland cells of neonatal rats. P.G.

A69-41196
ON LEARNING OF SPATIOTEMPORAL PATTERNS BY NETWORKS WITH ORDERED SENSORY AND MOTOR COMPONENTS. I—EXCITATORY COMPONENTS OF THE CEREBELLUM.
Stephen Grossberg (Massachusetts Institute of Technology, Cambridge, Mass.).
Studies in Applied Mathematics, vol. 48, June 1969, p. 105-132. 12 refs.
NSF Grant No. GP-9003; Contract No. N 00014-67-A-0204-0016.

Discussion of some nonlinear networks which can learn complicated spatiotemporal patterns among sensory and motor organs with linearly ordered components. These networks will ultimately resemble cerebrocerebellar systems of higher vertebrates. A new theory of learning, the theory of "embedding fields," is reviewed. The task studied is to find the simplest arrangement of embedding-field components between the input sources and the output sinks that can learn spatiotemporal patterns up to a given complexity. This is a boundary-value problem in function space. F.R.L.

A69-41202
RESPIRATORY CONTROL OF HEART RATE.
B. D. Charan and B. L. Deekshatulu (Indian Institute of Science, Dept. of Electrical Engineering, Bangalore, India).
International Journal of Control, First Series, vol. 10, no. 3, 1969, p. 293-301. 7 refs.

Suggestion of a new logical model for the respiratory control of the heart rate. The model includes the effect of pressoreceptor feedback in the production of the heart rate transient during respiration. The reflex is assumed to be initiated by a rate sensitive stretch receptor with varying compliances for inspiration and expiration. The effect of posture in altering the transient envelope is considered. M.M.

A69-41213
RESTING EEG ALPHA AND ASYMMETRY OF REFLECTIVE LATERAL EYE MOVEMENTS.
Paul Bakan (Michigan State University, Dept. of Psychology, East Lansing, Mich.) and Domin Svorad (Stanford University, Dept. of Psychology, Stanford, Calif.).
Nature, vol. 223, Aug. 30, 1969, p. 975, 976. 9 refs.
Research supported by the National Institute of Mental Health.

Investigation of the hypothesis that the tendency to move the eyes to the left is associated with more EEG alpha activity than the tendency to move the eyes to the right. A new relationship was found between measures of amount of EEG alpha activity and a measure of laterality of reflective eye movements. Both of these variables have been shown in the present and earlier studies to be related to hypnotizability. These findings indicate the possibility of physiological correlates of hypnotizability. M.M.

A69-41231 #
LIQUID FILLED ADJUSTABLE OPTICAL ANALOG OF THE HUMAN EYE.
Niles Roth (California, University, Jules Stein Eye Institute, Dept. of Ophthalmology, Los Angeles, Calif.).
Review of Scientific Instruments, vol. 40, Sept. 1969, p. 1214, 1215. 6 refs.
PHS Grant No. NB-06307.

Description of a liquid-filled analog of the human eye for aligning, calibrating, and systems testing of automatic IR optometers. Characteristics of the eye analog that render it useful as a test element are (1) corneal refractive power comparable with that of the human eye, (2) spectral transmission properties similar to those of the ocular media, (3) rotatable cornea for simulation of astigmatism of any axial orientation, (4) movable fundus (image screen) to simulate an adequate range of refractive errors, and (5) easily replaceable cornea to obtain different amounts of astigmatism.
(Author)

A69-41269 #
TOPOGRAPHY OF POTENTIALS INDUCED IN THE AUDITORY REGION OF THE CEREBRAL CORTEX OF DOG BY ACOUSTIC CLICK STIMULATION (TOPOGRAFIIA VIKLIKANIKH POTENTSIALIV SLUKHOVOI DILIANKI KORI GOLOVNOGO MOZKU SOBAKI PRI PODRAZNENNI ZVUKOVIM SHCHIGLEM).
V. A. Gmiria-Novi and T. V. Vasechko (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Viddil Elektrofiziologii Nervovoi Sistemi, Kiev, Ukrainian SSR).
Fiziologichnii Zhurnal, vol. 15, July-Aug. 1969, p. 441-449. 38 refs. In Ukrainian.

Study of the topography of potentials induced by acoustic clicks in the auditory cortex of a group of 10 dogs. Measurements of the potentials were made at 2374 points of the auditory cortex of the left and right hemispheres of the cerebrum. The characteristics of responses at some of the individual points are discussed in detail, showing that the induced potentials with initial negative polarity have certain regular patterns of localization. The distribution of positive and negative primary potentials in the ectosylvian gyrus is also discussed. V.Z.

A69-41270 #
DISCHARGES IN THE CORTEX OF CATS INDUCED BY STRYCHNINE UNDER THE ACTION OF STIMULI OF INCREASING INTENSITY (STRIKHNINNI ROZRIADI KORI MOZKU KISHKI' VIKLIKANI STIMULAMI NAROSTAIUCHOI INTENSIVNOSTI).
O. F. Dembnovets'kii (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Viddil Fiziologii Vishchoi Nervovoi Diial'nosti, Kiev, Ukrainian SSR).
Fiziologichnii Zhurnal, vol. 15, July-Aug. 1969, p. 450-456. 24 refs. In Ukrainian.

Study of the biopotentials of the auditory cortex of 19 anesthetized cats with monopolar and bipolar electrodes inserted to different depths into the cortex. Strychnine-wetted cotton tampons were applied to the surface of the cortex, and acoustic clicks of various intensities and amplitudes were used as stimuli. The properties of the cortical responses obtained are discussed, noting the dependence of the biopotentials on the intensity of applied stimuli. V.Z.

A69-41271 #
VARIATIONS IN BASIC HEMODYNAMIC CHARACTERISTICS UNDER THE ACTION OF DECORTICATION (ZMINI OSNOVNIKH GEMODINAMICHNIKH POKAZNIKIV PID VPLIVOM DEKORTIKATSII).
M. V. Il'chevich (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Viddil Fiziologii Krovoobigu, Kiev, Ukrainian SSR).
Fiziologichnii Zhurnal, vol. 15, July-Aug. 1969, p. 457-466. 45 refs. In Ukrainian.

Investigation of the arterial pressure, the heartbeat rates, the blood volume, the total peripheral blood pressure, and the cardiac and systolic indices in a total of 43 experiments on decorticated rabbits. A comparison with the results of observations of control rabbits suggests that decortication reduces the responses of the vasomotor center of the medulla oblongata and decreases the energy level of the cardiovascular system. Pituitrine administration produced a weaker pressor reaction and a smaller reduction of the minute blood volume in decorticated rabbits than in control rabbits. It is concluded that decortication upsets the compensatory and adaptive capabilities of the cardiovascular system. V.Z.

A69-41272 #
CHANGES IN THE ADRENOCORTICAL FUNCTION DURING VARIATIONS IN THE FUNCTIONAL STATE OF THE HYPOTHALAMUS (ZMINA FUNKTSII KORI NADNIRKOVIKH ZALOZ PRI RIZNOMU FUNKTSIONAL'NOMU STANI GIPOTALAMUSA).
A. D. Lauta and G. Ia. Zavads'ka (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Viddil Fiziologii Neiro-Gumoral'nykh Reguliatsii, Kiev, Ukrainian SSR).
Fiziologichnii Zhurnal, vol. 15, July-Aug. 1969, p. 476-480. 26 refs. In Ukrainian.

Study of changes in the adrenocortical function of 85 patients with a diencephalic syndrome, after aminazine and adrenaline administration. The content of adrenal gland excretions in the urine was generally lower in all patients after aminazine administration, while the effect of adrenaline on the adrenocortical function showed no uniform pattern in individual patients with different forms of the diencephalic syndrome. V.Z.

A69-41273 #
EFFECT OF LOBELINE ON OXYGEN PRESSURE IN THE REGION OF THE GIGANTOCELLULAR NUCLEUS OF THE MEDULLA OBLONGATA OF DOGS (VPLIV LOBELINU NA NAPRUZHENIIA KISNIU V OBLASTI GIGANTOKLITINNOGO IADRA DOVGASTOGO MOZKU SOBAK).
V. A. Berezovs'kii, L. G. Tomilina, and A. Ia. Rotar (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii and Institut Biokhimii, Kiev, Ukrainian SSR).
Fiziologichnii Zhurnal, vol. 15, July-Aug. 1969, p. 517-522. 25 refs. In Ukrainian.

Study of the effect of lobeline administration on the oxygen pressure in the gigantocellular nucleus of the medulla oblongata and on the respiration rates of a group of 9 anesthetized dogs. Glass-coated platinum electrodes and an automatic recording device were used for recording the oxygen pressure. Values of 39 (plus or minus 3) mm Hg are obtained for oxygen pressure in anesthetized dogs without lobeline administration. Higher oxygen pressure values and respiration rates are observed after lobeline administration. V.Z.

A69-41274 #
INVESTIGATION OF THE INHOMOGENEITY OF HEMOGLOBIN IN IRRADIATED ANIMALS (DOSLIDZHENNIA NEODNORIDNOSTI GEMOGLOBINU OPROMINENIKH TVARIN).
M. F. Starodub (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Viddil Radiobiologii, Kiev, Ukrainian SSR).
Fiziologichnii Zhurnal, vol. 15, July-Aug. 1969, p. 553-555. 12 refs. In Ukrainian.

Study of hemoglobin changes in two groups of rats irradiated with equal lethal doses of X rays or fast neutrons. Samples of crystalline hemoglobin, obtained by conventional techniques from the rats, are divided into four fractions by column chromatography with aluminum oxide. A comparison with control hemoglobin specimens indicates substantial changes in the proportions of individual fractions in the hemoglobin from X-irradiated rats and still greater changes in these proportions in the hemoglobin from rats irradiated with fast neutrons. V.Z.

A69-41275 #
ROLE OF SUBCORTICAL STRUCTURES OF THE CEREBRUM IN CONTROLLING THE CENTRAL AND PERIPHERAL FUNCTIONS OF THE NERVOUS SYSTEM (ROL' PIDKORKOVIKH STRUKTUR MOZKU V REGULIATSII TSENTRAL'NIKH I PERIFERICHNIKH FUNKTSII NERVOVOI SISTEMI).
V. O. Cherkes (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Laboratoriia Fiziologii Pidkorkovikh Struktur, Kiev, Ukrainian SSR).
Fiziologichnii Zhurnal, vol. 15, July-Aug. 1969, p. 556-565. 66 refs. In Ukrainian.

Review of the results of published studies concerning the participation of cerebral subcortical structures in controlling the functions of central and peripheral nervous systems. Contributions of various subcortical sections of the cerebrum to this control mechanism are considered in the light of these studies. Coordination of motion, orientation in space, search reflexes, and physiological sleep are discussed specifically as areas in which the subcortical cerebral activity has a controlling effect. V.Z.

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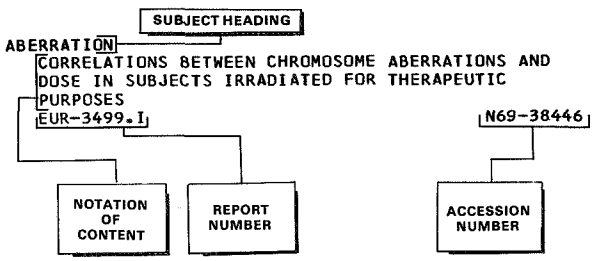

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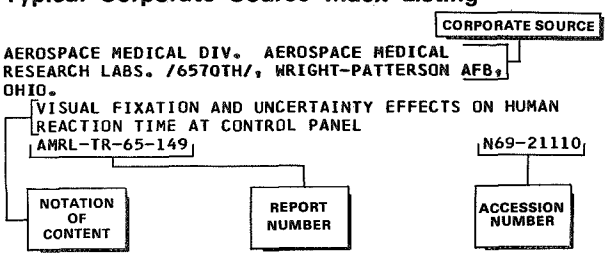

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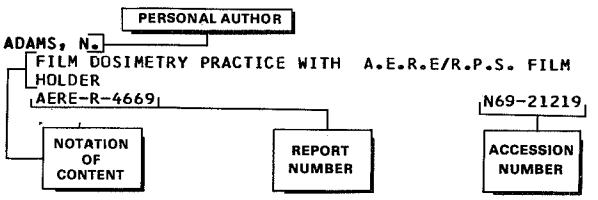

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